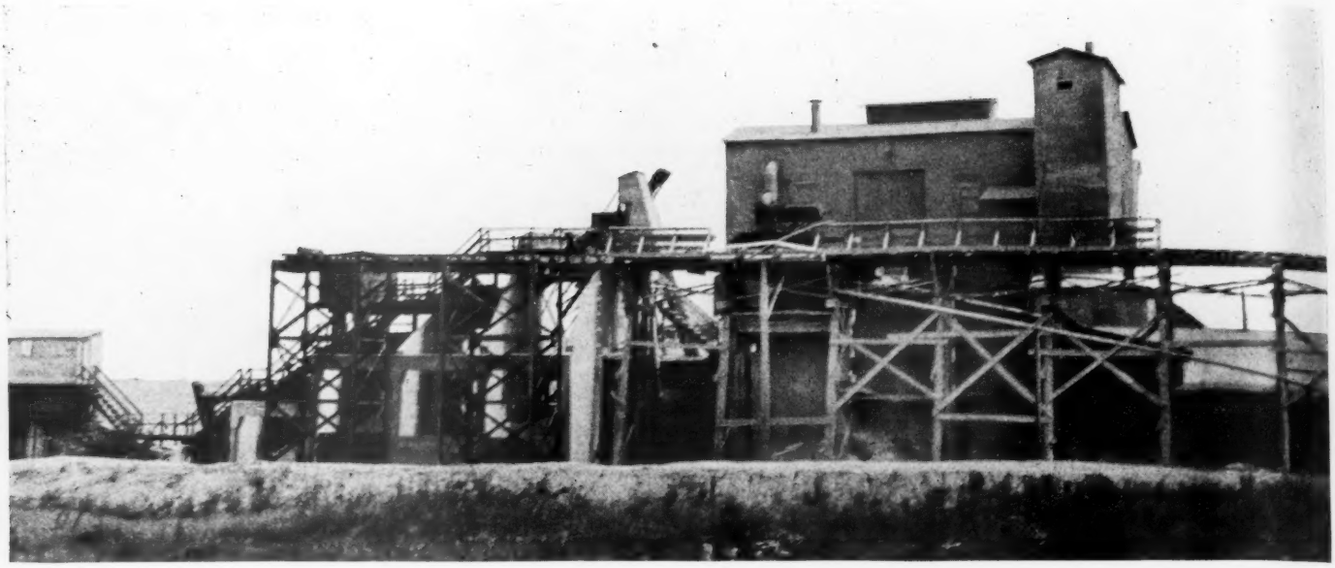
Vol. XXX Chicago, October 1, 1927 No. 20

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Limestone quarry of the Riverton Lime Co., Riverton, Virginia—an interesting lime and crushed stone operation



The rock comes in over the "high line," is dumped to the primary and secondary crushers and then sent to the washing plant (at the left). The screening plant is to the right of this.

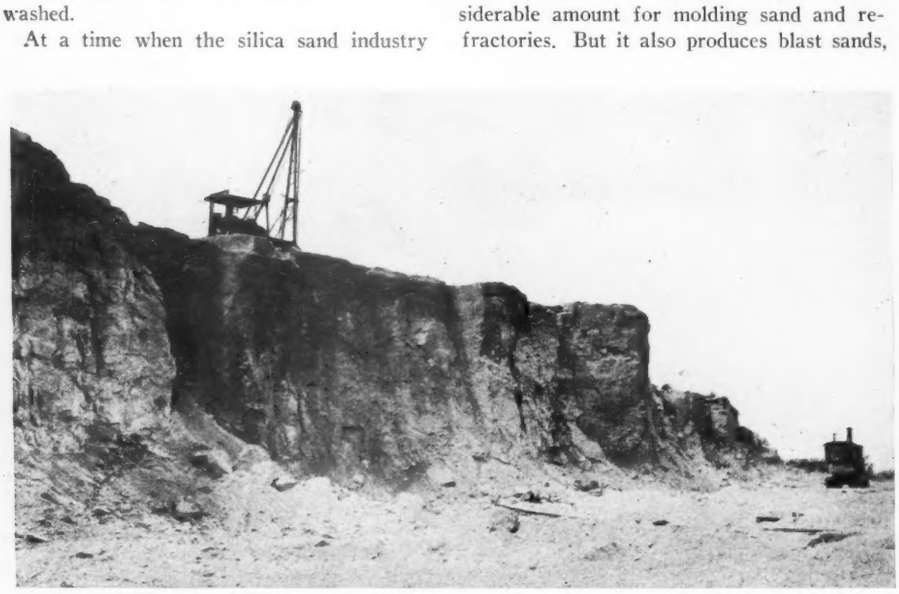
Quarrying for Silica Sand and Gravel

Columbia Silica Co., Akron, Ohio, Produces Fifteen Sized Products of Practically Pure Silica

THE Columbia Silica Co. of Akron, Ohio, is unusual among silica producers, in the kind of material it works and the products it makes. It quarries a conglomerate, using well-hole drills which are loaded and shot in the usual manner, but its products are not crushed stone, but washed sand and gravel. Fifteen sized products are made for various uses, and some of them are recrushed material. All of the products are practically pure silica, the SiO_2 content running close to 99%, after the bank material has been washed.

At a time when the silica sand industry all over the country is retrenching and cutting down production, the Columbia Silica Co. has been expanding and improving its plant to keep up with the demand for its markets. It is able to do this because it makes such a diversity of products. It is not dependent on the glass industry as the producers of glass sand are, nor on the steel and iron trade as the producers of molding sand and refractories are. The Columbia company produces silica that will do for ordinary qualities of glass and sells a considerable amount for molding sand and refractories. But it also produces blast sands, special plastering and finishing sands, fillers used in the soap and other industries, filter sands and gravel, and even concrete aggregate, both coarse and fine. The fine aggregate, possibly due to the puzzuolanic effect of the finer particles, has a pronounced effect on the hardening of concrete.

This shows the structure of the conglomerate



The 45-ft. quarry face represents only a part of the depth of the deposit

The original Columbia Silica Co.'s plant has been in operation for several years. At first it merely crushed the conglomerate to free the grains and pebbles and then dried and sized them over vibrating screens. Finding that the demand of the better market

The steam shovel is fired with oil which avoids contaminating the silica

was for as near a pure silica as it was possible for it to make, a washing plant was erected something over a year ago. A part of the material is now sold "green," as it comes from the washing plant, and the remainder is dried and sized, or dried and crushed and sized, to make other products. When the plant was visited about September 1, 1927, a set of rolls and a screen were being installed to make certain special sizes of sand, not included in the regular fifteen produced, but for which markets had developed.

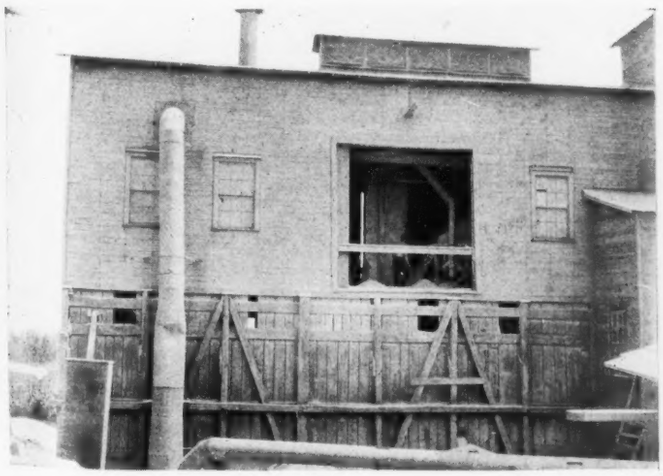
Quarry

The quarry is in a rather flat-topped hill, almost bare, which rises perhaps 100 ft. above the surrounding country. The exposure permits a quarry face perhaps 600 ft. long. A face 45 ft. high is being worked, but there is plenty of material for a lower face when this one has been worked back as far as is desirable. Holes are set 12 ft. apart and given 12-ft. burden. Although the sand and pebbles are almost pure silica, and very hard, the conglomerate as a whole is not hard to drill. The Sanderson-Cyclone well drill employed has put down 90 ft. (two holes) in a 10-hr. day, although something between one and two holes is a more usual record. All the load is placed in the bottom and the conglomerate fragments fairly well. There are some large, rounded fragments (like boulders) that have to be broken before they can be loaded, and for this work Ingersoll-Rand Jackhamers are used, air being furnished by a portable compressor, of unknown make, powered with a gasoline engine. The same portable compressor set is run down to the plant ocasionally and used to "blow out" motors.

The procedure is like stone quarrying and it also resembles the work carried on in some cemented sand and gravel banks. Of course this conglomerate was a sand and gravel bank at one time, but it was laid down ages before the sand and gravel banks of glacial origin, so generally worked today, were formed.

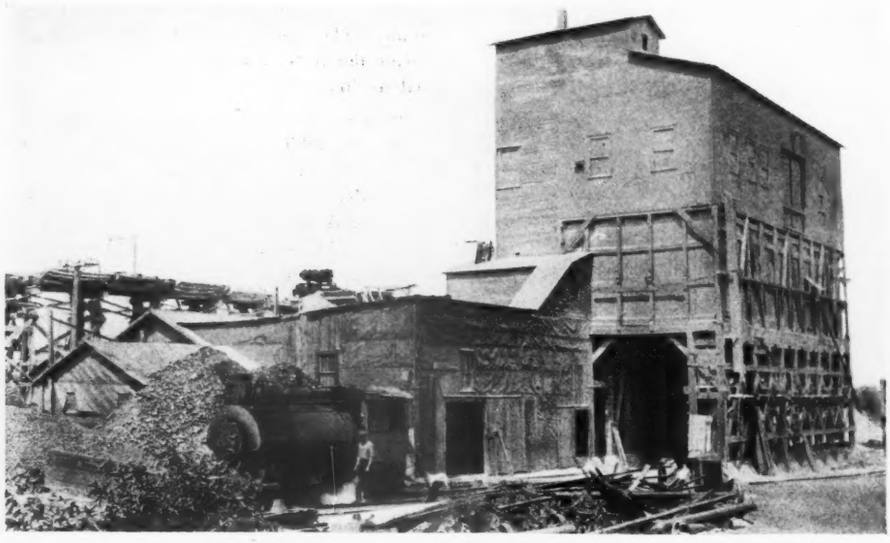
The quarried rock is loaded into 4½-yd. "Western" side-dump cars by a Marion Type 7 steam shovel, with a 1-yd. dipper. This is a new type of shovel and it had been in operation only a few weeks when the plant was visited. It uses oil for fuel, and F. E. Holcomb, the manager of the Columbia company, says that in his opinion it is the ideal machine for work in a silica quarry, especially where electricity is not easily available. The contamination of the silica by coal and ashes is a serious matter where the product must be as pure as pos-

The washing plant from which the crane lifts the products to the hopper of the dryer



The screening plant. Note the pipes for dust recovery

Head of the washing plant and elevator from disintegrator



Drying and screening plant and shipping bins

sible, and besides cleanliness oil has other advantages in cheaper firing and in saving fuel costs where the shovel operation is not continuous. The cars are drawn into the plant by Vulcan dinkeys and dumped directly into the hopper of the primary crusher. The plant is about a quarter of a mile from the quarry face.

Crushing

The primary crusher is a single-roll crusher, with a 24x60-in. toothed roll made by Allis-Chalmers. It seems a peculiar machine to use on silica rock, but its only purpose is to break up the cemented lumps, without crushing the pebbles, and it does this very well. The discharge goes to an even more peculiar machine which is not a crusher, although it takes the place of a secondary crusher. It is called a "disintegrator" and it was designed by C. R. Bartlett, of the Bartlett & Snow Co., Cleveland. It is a box containing two circular cages, one within the other. The outer cage is 36 in. in diameter and the inner 30 in., and both are made of 2-in. steel pins held between a flat disk and a ring. The cages revolve in opposite directions. The lumps are fed into the center and as they escape by passing through the revolving cages they are thoroughly broken up by the beating of the pins. The pebbles and sand are freed from the cementing material by this machine. The same machine has been used for breaking up lumps of clay and of clayey sand.

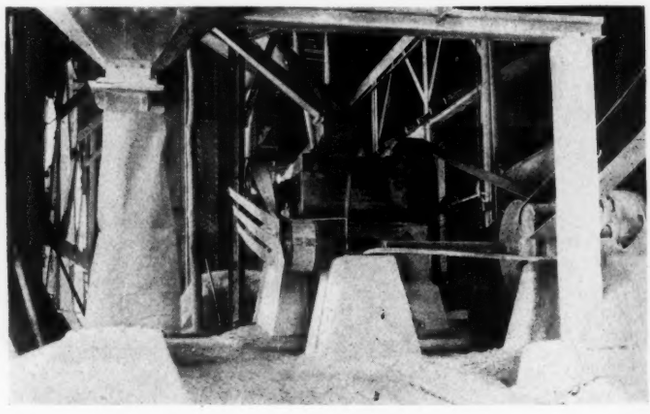
The discharge of the disintegrator passes to a short conveyor belt and so to the boot of a 12-in. bucket and belt elevator, 50-ft. centers. This raises it to the first screen of the washing plant. There are four screens in series, all of the Gilbert type and of Stephens-Adamson manufacture. They have 1¼-in., ¾-in., ⅜-in., 1¼-in. and 1/32-in. perforations respectively, the 1/32-in. holes being in an outer jacket. Each through size goes to a bin, and the water with the finest sand goes to a box which is fitted with a dewatering belt elevator that lifts the sand to a stock pile.

Separation Practice

Some of the products are loaded to cars directly from the bins by a Brownhoist locomotive crane and are sold as "green" sand. The remainder of the products are dried as desired to make filter sand, blasting sand and other carefully sized products.

The dryer made by Bonnot company is a single cylinder 60 ft. long. It is fired by coke so that no smoke shall discolor the

Looking into the hopper of the single roll crusher



One of the two rolls used to crush silica pebbles

Housing over primary crusher and portable compressor for blowing motors

These 4 1/2-yd. quarry cars take the conglomerate to the crushing plant

sand. The feed is from a hopper on the roof of the dryer, and this is kept filled by the locomotive crane.

For making blast and filter sands the material is passed through a set of Buchannan rolls which crush the pebbles. These have a 14-in. face and are of 24-in. diameter. The product of the rolls goes to a 12-in. elevator which lifts it to the screening department on the floor above. There are three Sturtevant vibrating screens in series there, and the products from all of these go to elevators which lift them to the plant bins. From the bins the products are loaded into railway cars or trucks. A very considerable portion of the product is shipped by truck, and truck shipments tend to increase.

Another 14x24-in. Buchannan roll was being set up on the day the plant was visited. This is to make special sizes, and it is in closed circuit with a Hum-mer screen, the decks of which will be covered with screen Sturtevant vibrating screens in series there, orders received.

All the machines which handle the dried material, the dryer, the rolls and the screens, are connected to a Sly dust collecting system, through which the dust is drawn by a fan. This dust is reckoned as one of the regular products of the plants, as there is a strong demand for it for use as a filler and an abrasive. The manufacturers of soap pastes for cleaning the hands of mechanics use a great deal of it.

The fifteen regular sized products of the plant include: Pebbles, 1¼-in. to ¾-in., ¾-in. to ⅜-in. and ⅜-in. to ¼-in.; six sizes of blast sand from ¼-in. down; two sizes of "green" molding sand and two sizes of dry molding sand; sand from ¼-in. to 1/32-in., and the dust that is blown over from the various machines.

Water Supply

The water supply is one of the interesting features of this plant. When a washing plant was to be built, wells were drilled in the low ground near the plant without striking much water. Then a 4-in. hole was drilled in the hillside nearer the quarry and water was struck. A 6-in. hole was put down and the flow of water was so strong that it was piped to the plant without pumping, the pipe acting as a siphon. Finally a 14-in. well was sunk in the hillside and fitted with a Lakey deep well pump, made in Columbus, Ohio. This was connected to an electric motor and the combination pumps 350 g.p.m. steadily without lowering the water level in the well seriously. This is not water enough for plant purposes, so the overflow from the sand box mentioned in the description of the washing plant is settled in a good-sized pond and the clear overflow is pumped back to the plant.

Originally the plant was built with a steam-electric power plant, reciprocating engines being used to drive generators. This system was abandoned recently and power is now purchased. The plant has been more completely motorized than it was before, as some of the machines were driven through belts from the engines in the original layout. The motors used are of two or three makes and the list includes the old generators which have been turned into motors.

F. E. Holcomb

The office of the company is at the plant, which is on Copley road about six miles west of Akron.

P. A. Snyder is president and treasurer of the company, F. E. Holcomb is vice-president and general manager, and T. S. Beaven is superintendent. The production is about 300 tons per day.

Thirteen of the 15 sized products regularly made

Special Requirements of Asphalt Sand

A TYPE of "special" sand little known outside a comparatively small group engaged in producing asphaltic concrete paving is that called "Asphalt" sand. There are, however, several points of special interest in connection with asphalt sand, and these become of particular importance in a comparative analysis of the durability features of asphaltic concrete pavements.

The first requisite of an asphalt sand is, of course, that it be clean and structurally sound. Having determined its fitness under this requirement, an investigation of its size gradation is next in importance. It is in meeting this test that much of the sand used in early-day pavements, and some not so early, well far below the desired standards. A proper gradation of asphalt sand includes uniform quantities of all the sizes passing No. 10 to No. 200 mesh screens, and any appreciable divergence from this gradation renders a sand unsuited for this particular use.

In an asphalt sand it is essential that the percentage of voids be kept at a minimum and strict adherence to the uniform gradation is necessary to obtain this condition. Obviously a sand having the minimum percentage of voids will require the least amount of asphalt to fill those voids and form a dense mass. In case a shortage of one size and an excess of another exists in the sand, more asphalt will be required and a less stable mass will result when it is placed in the pavement. Under warm weather conditions the effect of traffic is to roll such a surface into the all too familiar ridges and hollows, much to the dissatisfaction of the motorist, and accelerating the destruction of the pavement base through the increased impact from the traffic.

For convenience in preparing suitable asphalt sand it is commonly graded in three groups as follows:

No. 10 to No. 40 mesh
No. 40 to No. 80 mesh
No. 80 to No. 200 mesh

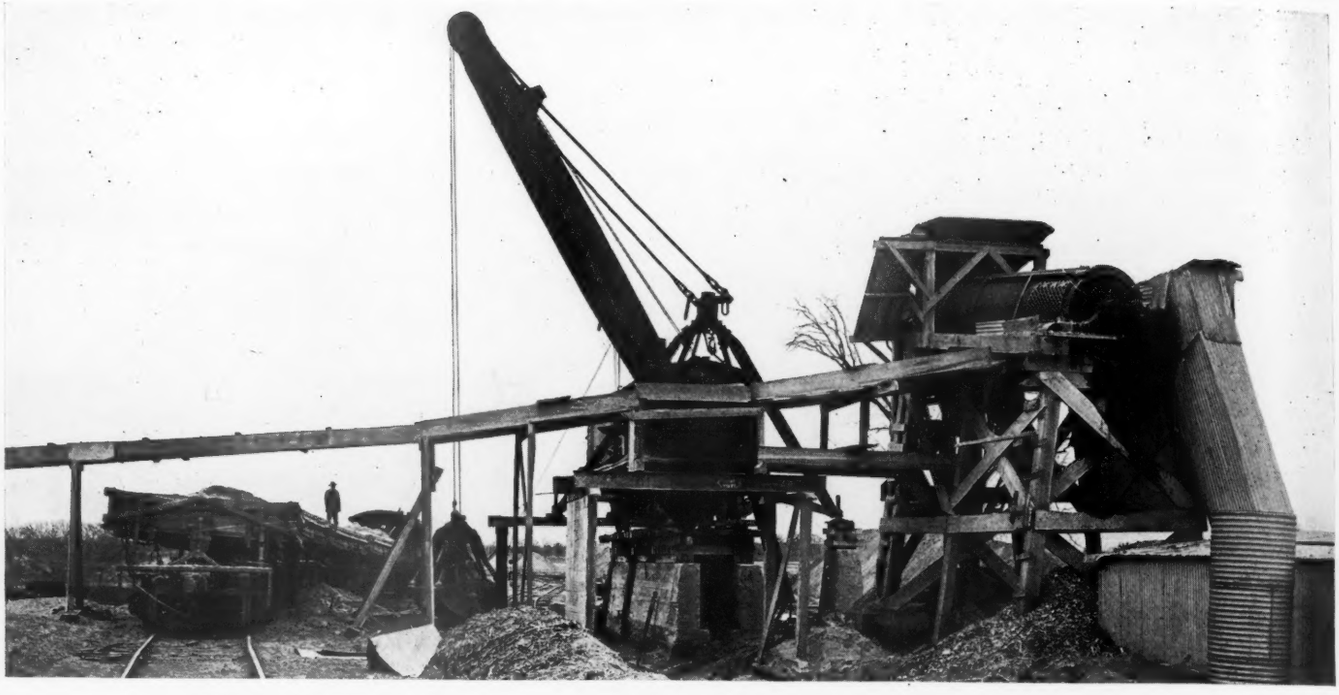
The chief difficulty with the old asphalt sands used in Kansas City was the excess of No. 40 to No. 80 mesh sizes and the deficiency of No. 80 to No. 200 mesh sizes which they contained. The resulting mix carried an excessive quantity of asphalt, with the results above described.

In the territory embracing Greater Kansas City, western Missouri and eastern Kansas, the Stewart Sand Co., producer of classified building and "Special" sands, is now supplying a large part of the consumption of asphalt sand. This company prepares their asphalt sand by mixing three different sands in the proportions to give the desired gradation. With this method, perfect control of the resultant size gradation is obtained by varying the proportions of the three sands going into the mix.

Experience here and elsewhere with asphaltic concrete surfaces built with properly graded and proportioned aggregates indicate that this feature of their construction is all-important in obtaining a satisfactory and durable pavement; and in striving to furnish a satisfactory asphalt sand, the Stewart Sand Co. is contributing its share in prolonging the life and rendering more comfortable the use of our asphalt concrete pavements.—*Better Building* (house organ of the Stewart Sand Co., Kansas City, Mo.).

Inundation

"INUNDATION" is a beautiful pamphlet issued by the Blaw-Knox Co. of Pittsburgh, Penn., to advertise its inundation system of mixing concrete. It gives a thorough exposition of the theory of inundation and shows how the water-cement ratio of concrete may be mechanically controlled by the use of the system. The pamphlet is illustrated with very large reproductions of photographs, that show every detail of the machines employed, and with blue prints.



The washing and screening plant. An old railroad type shovel serves as a whirly derrick

Changing From Pit Run to Washed Gravel

J. Fred Smith Gravel Co., of Dallas, Texas, Alters Production Methods by Simple Means

By Jean H. Knox
Consulting Engineer, Dallas, Texas

THE J. Fred Smith Gravel Co. of Dallas, Texas, had been operating industriously and profitably their thousand acres of gravel land for ten years up to about six years ago, shipping pit-run gravel for general purpose concrete aggregates. When separated aggregates were required as for state highway construction governed by federal aid specifications, the contractor often set up a scalping plant on the job, separated the aggregates, wasting the excess sand and recombining the sand and gravel according to the required mix proportions for concrete.

Dragline operating in coarse gravel deposit

Due in part to the practical impossibility of obtaining a uniform and properly balanced pit-run gravel over a sustained period of time, and in part due to more exacting specifications and increasing demand for better graded aggregates for structural concrete, this company and others of defined policies in the sand and gravel industry began to devise ways and means for separating and washing their sand and gravel. Rhea Miller of this company had had previous experience in industrial building, as had Chas. H. Jackson, while John Locker, superintendent, was an experienced and practical mechanical engineer. All had been engaged in operation of pit-run gravel production for several years. A number of washing and screening plants were visited, operations were observed and plans drawn designating standard equipment, but estimates of cost for guaranteed production seemed high, and too, this company wished to use so far as possible their own power equipment.

A 48-in. by 18-ft. Allis-Chalmers cylindrical screen frame and parts was purchased and

set up on a heavy timber frame 22 ft. in elevation at a site chosen with regard to economical haul from pits to plant and from plant to shipping point on the Frisco railroad.

A 6x6x6-ft. wood frame gravity feed hopper was set to feed the screens, pipe nozzles connected up for washing and rinsing, chutes and guards secured, with an overflow trough on one side to carry away washing water and sand, and one loading chute on opposite side of plant to discharge gravel direct into cars. It is interesting to note that at first all the sand was wasted, and the gravel reclaimed to build up the pit-run gravel which had an excess of sand. A 10-hp. Fairbanks-Morse gas engine drove the screens by means of a well-housed 8-in. six-ply rubber belt at controlled speeds of 16 to 20 r.p.m.

About 10 ft. of overburden covers the gravel in this section of the deposit. The water level is about 2 ft. below the top of the gravel

A New Use of an Old Railroad Shovel

The idea of a belt or bucket conveyor to elevate pit-run gravel to screen hopper was abandoned in favor of raising the material by a derrick hoist. The company owned two locomotive type Marion steam shovels, Models 60 and 61. The Marion 60 was converted into a derrick swing hoist by setting it up on heavy concrete foundations adjacent to the plant, at 10-ft. elevation, retaining the boom and the swing gear and adding a special drum hoist and sheaves to operate a 1½-cu. yd. clamshell bucket. The 150-hp. boiler on the Marion also furnished steam through a protected steam line to a three-drum 40-hp. Lidgerwood hoist set up 175 ft. east of the plant to spot cars on the loading tracks.

A deep pit was excavated and concreted, in size 12 ft. wide by 24 ft. long by 10 ft. deep, located for the minimum distance of the derrick swing from the pit to the screen hopper. The track alongside was elevated about 3 ft. to allow full discharge of pit-run gravel from railroad Western dump cars to this pit.

As there was an abundant supply of water for washing purposes in a nearby open pit, with water level some 8 ft. below ground level, a 4-in. pump and line was installed, driven by a 10-hp. gas engine. A little later a 6-in. pump and 20-hp. engine was installed, then two 20-hp. engines were connected up to pump more water. Two years later there seemed danger of a water shortage, so a 12-in. well was drilled 365 ft. deep into some 78 ft. of water bearing sand of the Woodbine strata. A low lift American centrifugal pump with 10-in. suction and 8-in. discharge was installed and driven by a 50-hp. Bessemer gas engine, using distillate for fuel. The company had learned the value of an adequate water supply and its great importance for quality and quantity production. More than 1600 g.p.m. is now available.

A 50-ton Schenectady switcher locomotive now serves cars to the draglines used for digging, and plant, and loading cars to Frisco siding for shipment. Four 16-cu. yd. and two 12-yd. Western dump cars are used between the draglines and the plant and for loading overrun of gravel to storage.

The demand for clean washed sand increasing, the company installed a No. 9 Telsmith sand tank, and constructed a loading track beneath. Then a second gravel loading chute and third loading track were added. The plant has no storage bins, their temporary advantage in this case being offset by a saving in initial investment and by low lift and a single handling at the plant.

This company has also determined to its own satisfaction that the smaller capacity railroad dump cars with lower maintenance costs are more economical in operation than larger capacity cars having higher maintenance and more lost time for repairs.

A long house track runs parallel to the three loading tracks and one serving track, and with the tracks to the three gravel pits and the main line, there is approximately four miles of track altogether. Seventy-pound rail is used and good white oak ties, which are obtained at reasonable prices.

Discharging sand and gravel to cars

Screening hopper and loading chutes over the tracks

A No. 14 Bucyrus steam-operated dragline with 2-yd. bucket is located on the property about three miles from the plant, and is used to load out orders for ballast and pit-run gravel.

Draglines for Pit Excavation

Two Marion steam draglines, Models 36 and 31, having 1½- and 1-yd. dragline buckets, operate in two pits near the plant, the smaller dragline mining a sandy pit-run and the other mining in a coarse gravel material. This makes a very good arrangement for balancing production tonnages for either sand or gravel.

The sand and gravel deposits on this property are known as wet deposits and lie in the level land of the first bottom of the Trinity valley. They vary here in depth to 16 ft., with overburden usually from 1 ft. to 4 ft. in thickness of sand or sand and clay. The formation under the gravel beds is blue shale. These particular deposits are considered commercially reclaimable where the depths of gravel and overburden are equal and when the total depth of overburden to be stripped does not exceed 12 ft. The company owns slightly more than 1000 acres of land with a satisfactory reserve of tested gravel deposits.

With a pit-run material with low clay or silt content which is easily cleaned, with an adequate volume of washing water (and using square mesh wire screens), this plant has a capacity of more than 150 tons per hour of washed and graded separate aggregates. The bulk of shipments is by rail, although one dealer operates a fleet of trucks hauling sand and gravel a distance of 15 miles into Dallas.

The plant is located 16 miles north of Dallas on the Frisco railroad. The offices of the J. Fred Smith Gravel Co. are suite 1202 Southwest Life building, Dallas, Texas. Plant organization consists of 16 men regularly employed. Rhea Miller is secretary-treasurer and general manager. Chas. H. Jackson is in charge of sales and W. N. Jackson is sales representative. John Locker is superintendent at the plant.

Mineral Production of United States Shows Substantial Increase in 1926

IN 1926, the industries producing minerals in the United States and preparing or reducing them for use, were, as a whole, maintained at a higher level of productivity than during 1925, a year of marked prosperity and high records in output, declares Frank J. Katz, chief engineer, Division of Mineral Statistics, of the United States Bureau of Mines, Department of Commerce, in a review just made public. Only a few important products deviated sharply from this general condition.

Measured by total value of mineral products — $6,262,000,000 — the output of 1926 was the next largest ever recorded. Although the corresponding figure for 1920 is $6,981,340,000, price levels have so declined since that year, when they were at their peak, that the real value of the nation's mineral production for 1926 represents at least an appreciable, if not a substantial, increase over 1920. As compared with the values of the total mineral output for 1923, 1924, and 1925, in which years the average price levels of all commodities were not materially different from that of 1926, increases of 5, 18, and 10%, respectively, are indicated.

All the mineral fuels were produced in larger quantities in 1926 than in 1925. The total output of bituminous coal closely approximated the war record and exceeded the record made in 1923, a more normal year. Anthracite production was evenly maintained at a good rate after the strike settlement late in February.

A new record in the output of crude petroleum was attained by gradual increase throughout the year; nevertheless stocks of crude petroleum were considerably reduced.

The aggregate value of the output of metals in the United States in 1926 showed a small increase over 1925. Among the metals of major importance, the most notable large increase was shown by zinc, whereas gold and silver showed notable decreases.

The domestic production of copper increased moderately. Imports of copper into the United States were larger, whereas the slackening of foreign demand is indicated by smaller exports. A marked increase in domestic demand was, however, insufficient to offset these factors, and domestic stocks increased. The price trend was very slightly downward.

The lead and zinc industry in 1926 was characterized by record production, intense activity, high prosperity, and excellent demand, although price levels were slightly lower than in 1925.

In magnitude of production, the iron and steel industry recorded a remarkable year in 1926. The production of steel was the largest ever recorded, and the production of pig iron was only a little less than in 1923, the record year. The output of iron ore was notably greater than in 1925 but still well below 1917, the banner year. The average price of ore for 1926 was virtually the same as in 1925. Prices for iron and steel were slightly lower, however, and consumption slightly higher.

The outstanding features with respect to manganese in 1926 were the smaller domestic production of high-grade ores, the extraordinary figures for the production of ferromanganese based on imported ores, the stable demand for manganese and manganese products, and the downward tendency of prices. The domestic production of mercury also decreased, but larger imports indicated corresponding increases in consumption, and prices rose materially during the year. There was virtually no production of chromite in the United States in 1926, but important increases in imports and the growing use of chromite as a refractory material are noted. Antimony mining and smelting in the United States in 1926 was at low ebb, despite the growing demand, which was met by increased imports from Mexico and Bolivia in addition to the Chinese supply. Prices were lower than in preceding years. Aluminum was produced in the United States during the year at about the same rate as in 1925; there was also little change in price.

Non-Metallics

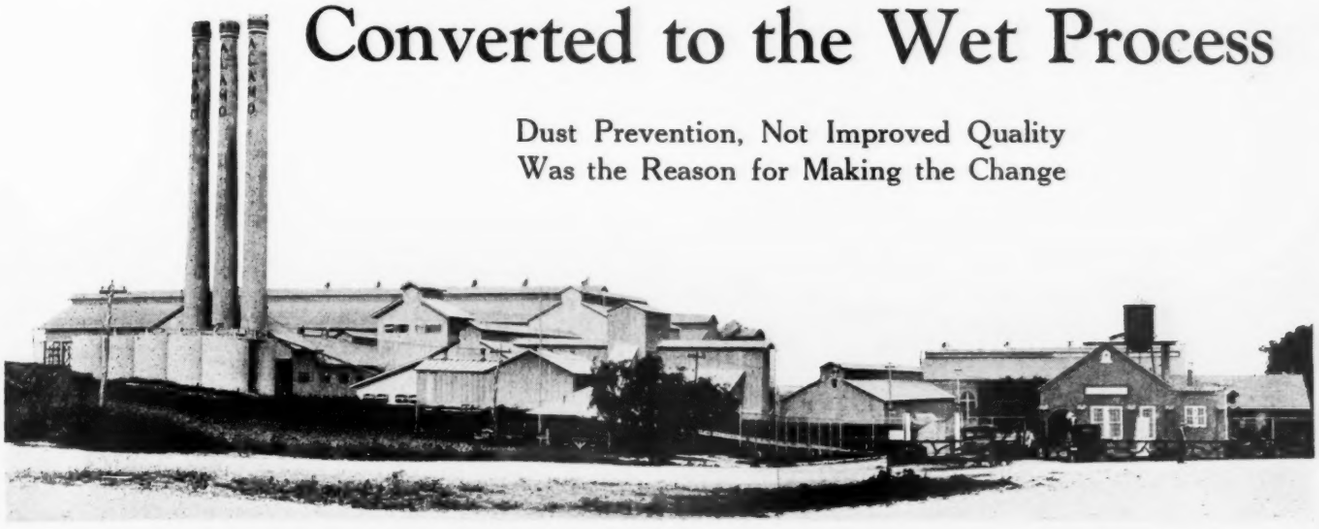
In contrast to the moderate increase shown in the aggregate value of the output of metals, the value of non-metallic mineral products, not including fuels, showed a slight decline in 1926 as compared with that of 1925, but nevertheless remained at a high level in relation to preceding years. The aggregate volume of production of mineral structural materials, including building stone, crushed stone, sand and gravel, lime, gypsum and cement, indicated that the demand for structural materials in 1926 had changed but slightly as compared with 1925. The average values of these materials changed little during the two years. The output of building stone and crushed stone, considered separately, increased somewhat, whereas the production of sand and gravel, etc., for concrete aggregate, and of lime and gypsum was about the same. Portland cement was produced in larger volume in 1926 than in 1925. Although sales of cement were larger than in the preceding year, they were less than production; producers, therefore, accumulated stocks of finished cement in unprecedented amounts.

Among the ceramic materials, feldspar alone showed material increase in 1926 over 1925 and established a new high record. Clay declined slightly in output; the total, however, remained higher than in other years before 1925. The mineral chemical materials, including fertilizers, pigments, metallurgical fluxes and refractories in general, showed little change or small decreases in 1926. Fluorspar, however, was an exception with material increase in the quantity and value of production marketed. Among the miscellaneous general industrial minerals, such as graphite, abrasive materials, fuller's earth, mica, asbestos and talc and soapstone, moderate increases in production were largely the rule in 1926, with demand and prices generally well sustained at the 1925 levels.

The importance to the modern world of the numerous and varied mineral industries and the extraordinary dependence of our economic civilization upon them are not indicated by their physical volume or their money value, Mr. Katz points out. Better appreciation of their importance is developed, for example, by realizing that the mineral raw materials of domestic origin constitute more than half, and, plus the products thereof in the first stages of manufacture, more than two-thirds of the freight handled by the railroads of the country.

San Antonio Cement Mill Recently Converted to the Wet Process

Dust Prevention, Not Improved Quality Was the Reason for Making the Change



General view of the San Antonio Portland Cement Co.'s plant at San Antonio, Tex.—recently converted to a wet-process mill

THE San Antonio Portland Cement Co. of San Antonio, Texas, recently changed its operation from the dry to the wet process and in doing so it built what is practically a new plant. It also introduced some features which are novel in American cement mill practice. One of these is the introduction of a pug mill to prepare the material for the raw grind. The power plant is unusual, as it contains only solid injection internal combustion engines direct conected to generators.

The change from dry to wet methods was made solely to get rid of the dust nuisance which the dry plant created. No better cement has been made by the wet process and the quality is no more uniform than it was with the dry process. The cost has been increased because the raw materials are such that an unusual amount of water has to be added to make a workable slurry. This takes more fuel to evaporate in the kilns than was needed to dry the rock in the dry process, and the difference is enough to increase the fuel consumption by about 8%.

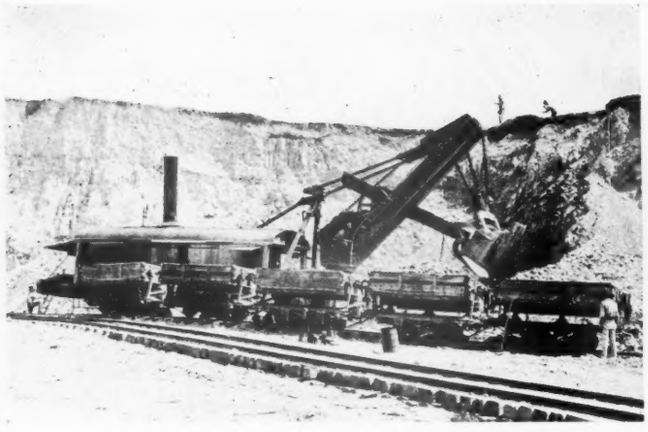
However, it is considered to be well worth what it costs to be rid of the dust. The plant is at Cementville, about five miles from the heart of San Antonio, and it stands near the center of a 500-acre tract that belongs to the company. Years ago, when the plant was built, there was no thought that the city would reach so far. But, like other thriving American cities, San Antonio has grown rapidly in the past few years and homes are beginning to crowd the edge of the tract. Although no serious complant of damage from dust had been received, Charles Baumberger, the president of the company, said that it was easy to foresee a time in which the plant would be considered a very bad neighbor. It was to prevent this that the change from dry to wet process was made.

Such farsightedness is in line with the policy of this company. Mr. Baumberger is one of the pioneer cement makers of the country, as he began business in San Antonio in 1880. His plants have grown from small pot kilns, producing a few barrels daily, through a shaft kiln stage to small rotary kilns and then to larger and longer kilns as the possibilities not only of cement making but of kiln making developed. The plant was also one of the first to introduce systematic safety work and its efforts were rewarded by being the first to receive the Portland Cement Association safety trophy, in 1926. It is not surprising, therefore, that the change in social conditions was sensed and manufacturing methods adapted to them.

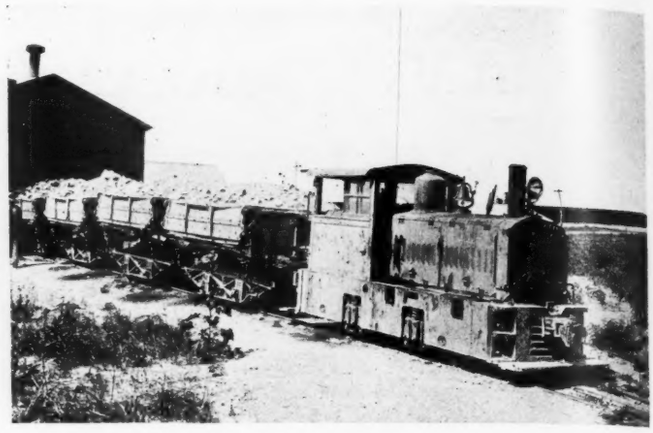
The material from which cement is made at this plant is, mainly, the Austin chalk, which is a ledge of Cretaceous origin, exposed in many places in the eastern part of Texas. The same chalk is used for making cement in the plants near Dallas. At San Antonio the chalk has nearly the proper proportions for a cement raw material. At times a little clay has to be added; at other times the chalk contains everything that is needed. In this respect it resembles the famous "cement rock" of the Lehigh Valley region, but the Austin chalk at San Antonio is higher in silica. The portland cement

Working over a long period of years has developed a long quarry face, averaging 65 ft. in height

A section of the quarry face. The division between the hard and soft rock shows at the right



Steam shovel loading cars in the quarry



Train of loaded cars headed for the crushing plant

made from this chalk runs with great uniformity at 64.5% CaO_3 and 22% SiO_2.

The quarry has been worked for years and a long face has been developed. Most of this is in what is called the soft rock. Since the introduction of the wet process the hard rock portion of the quarry has been more developed, as this material needs less water to make a workable slurry than the soft rock. It is expected that future operations will be in the hard rock.

The ground has been thoroughly prospected so that the lime and silica content everywhere is known. This enables the correction of the mix to be largely made at the quarry face. Two steam shovels are used, and the right number of cars from each are taken and combined to make the mix.

The face averages 65 ft. in height. The practice in shooting the rock varies according to its character, but generally holes are set 18 ft. apart and given 15 ft. burden. If they are in the hard rock they are loaded with 60% gelatin; in the soft rock they are loaded with No. 1 special powder. Cordeau-Bickford is used in all holes.

Well-hole drilling is by a Loomis-Clipper drill with crawler tread. The secondary shooting varies from the usual in that no drilling except hand drilling is done for it. Many large pieces are broken with "'dobe" shots.

The quarry track runs around the face, but a straight track across the floor is being laid to shorten the haul. All track is 36-in. gage. Koppel 6-yd. side-dump cars are loaded by 50-B and 70-C Bucyrus shovels, the 70-C being of the railroad type. The cars are pulled into the plant by a 12-ton Whitcomb gasoline locomotive.

Raw Mill

There is only one crusher, a No. 7 Mammoth Williams hammer mill. This is driven by a 250-hp. motor of the slip-ring type, which is in a separate room with the belt that connects it to the crusher pulley, in order to keep them free from dust. Around the crusher is the only place in the plant where any dust may be seen, and there is not very much of it there.

The hammer mill is fed by a Link-Belt apron feeder 50 in. wide, which is driven by a 15-hp. motor through a Lenox drive and vertical belt.

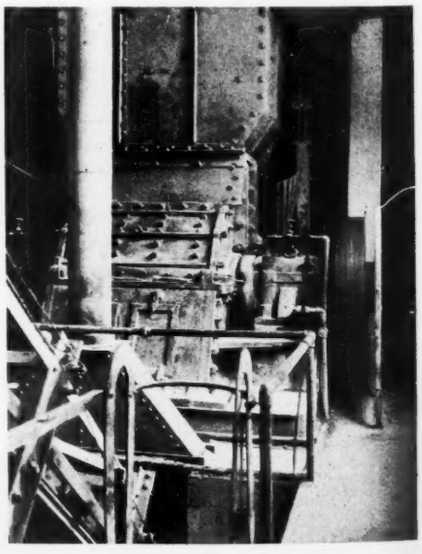
Clay is added, when needed, at the hopper of the hammer mill. A laborer puts in a certain number of shovels every minute as he is directed. Passing through the hammer mill, the clay becomes pretty uniformly mixed with the chalk, and there is never enough clay to interfere with the crushing.

The hammer mill discharge goes to a 30-in. inclined pan conveyor of Link-Belt make which raises it above the storage house. It falls on a shuttle conveyor 40 ft. long mounted on a steel frame which can be run back and forth on a track. As the belt is reversible, any part of the bin beneath can be filled from the belt. The movement of the belt frame is by throwing a hitch with a rope over a cathead on one of the pulley shafts of the conveyor. This causes the frame to pull itself along. A sample of the material going into storage is taken every 30 minutes.

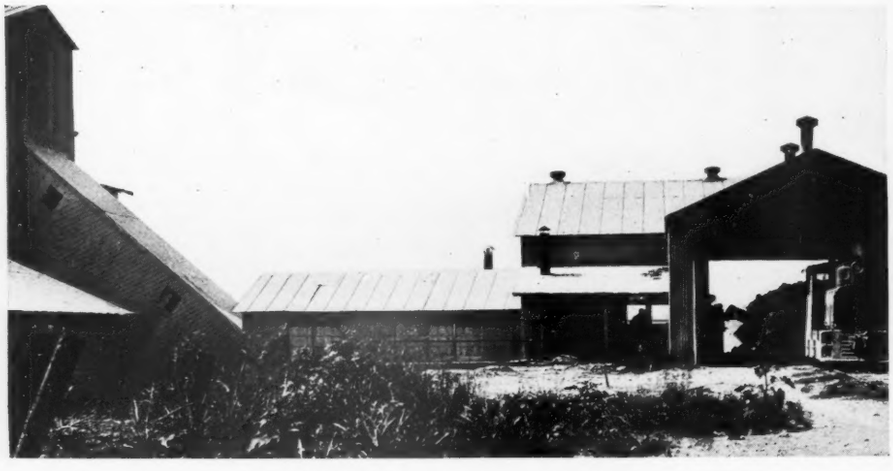
Underneath the storage pile is a 24-in. belt, 110-ft. centers, that runs in a concrete tunnel. There are five gates in the roof of this tunnel and the material may be drawn off from one or more than one of these, as desired, enabling some correction to be made here. The belt conveyors in this storage department are of Stephens-Adamson make.

The tunnel belt discharges to the boot of a second inclined Link-Belt pan conveyor, 30 in. wide and elevating 65 ft. This discharges into a hopper holding about 20 tons, which is over the pug mill.

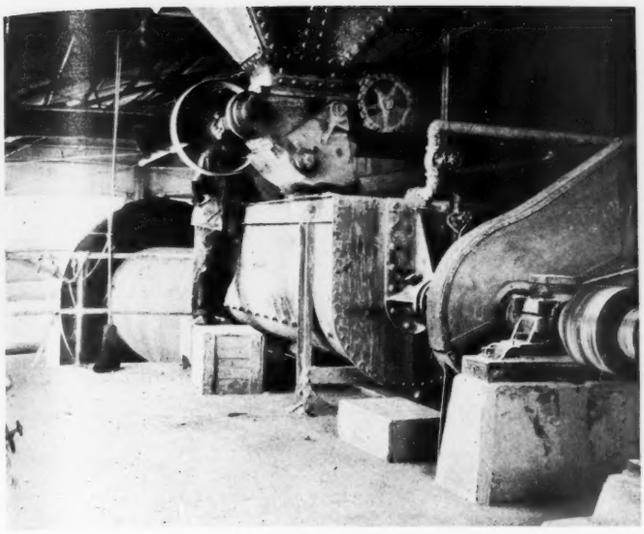
This pug mill was introduced by H. O. Rinehold, the plant manager, after considerable experimenting with a small size tube mill, with and without a pug mill preceding



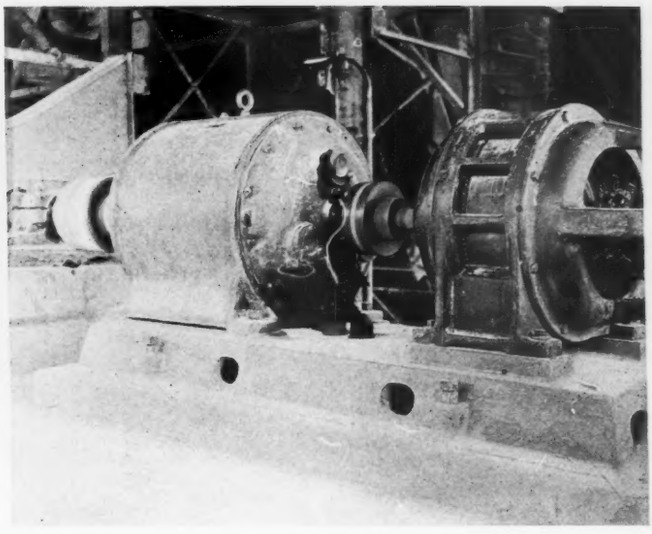
The hammer mill crusher—the only crusher in the plant



Crushing plant and conveyor gallery



Pug mill precedes the tube mill—a novelty in cement mills



Electric motor and speed reducer drive on the pug mill

it. He had the idea that with soft materials he could get much more efficiency from any mill that used balls for grinding by mixing the material thoroughly with water before admitting it to the mill. If this were not done, much of the energy of the ball mill would be wasted in tearing apart lumps of soft material. His experiments convinced him that the theory was right, and F. L. Smidth & Co.'s chief engineer, P. T. Lindardt, agreed with him after working for some days with the small model. The pug mill is the ordinary machine used in preparing brick clay, a shaft with blades set screw-form in a 10-ft. trough. At first the blades were all right hand, set to move the material forward, but it was found better to put in one left-hand blade to two right-hand blades, to keep the material from going through too fast and to give it a better mixing. The pug mill is driven by a 25-hp. motor through a Jones speed reducer.

The pug mill is fed by a segmental feeder on the bottom of the hopper above it, which can be set to regulate the quantity passing. From the pug mill the material flows directly into a 7x30-ft. Smidth compartment mill driven by a 600-hp. super-synchronous motor. The first compartment contains 2-in., 3-in., 4-in. and 5-in. balls forged from high carbon steel, which has been found to give the longest service in this particular slurry. In the finishing compartment there are 66,000 lb. of 1¼x1-in. slugs.

A 7x45-ft. Traylor compeb mill is soon to be added to the raw grind department. This will be preceded by a pug mill and the feed to it will be regulated by a Schaffer poidometer.

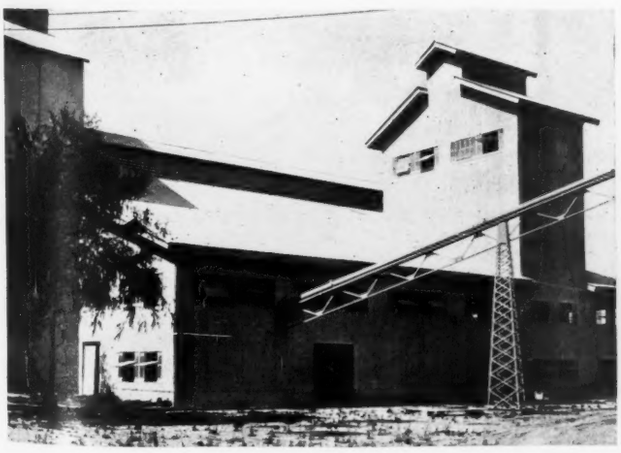
Slurry Handling, Mixing and Correction

The mill has a peripheral discharge and the slurry runs from it into a concrete sump which is 10x10 ft. square and 8 ft. deep. A pipe from the side runs into the suction of a 4-in. Wilfley centrifugal slurry pump direct connected to a 30-hp. induction motor. This pumps to the slurry tanks through an inclined pipe-line, supported on a light steel trestle, to the ten slurry tanks.

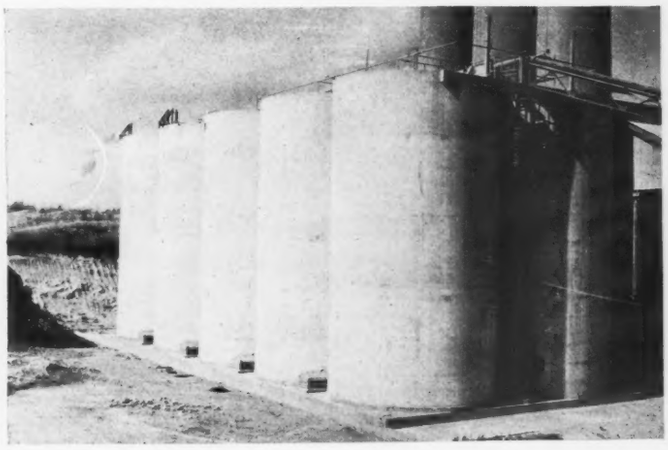
The system of transferring, handling and mixing slurry for correction is about as simple in this plant as in any that has come to the writer's notice. There are ten slurry tanks, each 20x40 ft., set in two parallel lines. They are fed from an open concrete trough into which the pump mentioned discharges. Gates in openings at the side of this trough enable the slurry to be run into one or more tanks as desired. Agitation is by a single jet of compressed air. This rises from the center of the bowl-shaped bottom of the tank and impinges on a curved shield which causes it to sweep the tank bottom. A circulation throughout the whole body of the slurry in the tank is set up in this way. A single 6-in. air pipe runs from the compressor below all the tanks, and branches leading off at an angle supply each with air.

The space under the tanks is kept dry and cool by shafts that run to the top, each of which is capped by a ventilator. Keeping such places cool is a matter of some importance where the weather gets as hot as it sometimes does in San Antonio. For drainage there are two small Economy automatic well pumps run by a motor that is started and stopped by a float. Eight of these automatic drainage pumps are used in various parts of the plant.

The slurry is discharged by 8-in. pipes that lead out near the bottom of each tank into a storage basin. One or more tanks may be drawn at a time and the general practice is to draw two. Correction in this way keeps the lime content of the slurry very close to the 77% desired, the actual



Raw grind plant and pump line to the slurry tanks



The 10 slurry tanks, each 20 ft. in dia. and 40 ft. high

variations shown by the laboratory record running between 76.84% and 77.12%. The slurry basin is 16 ft. long, 10 ft. wide and 8 ft. deep.

From this basin the slurry is pumped by another 4-in. Wilfley pump, connected to a 30-hp. motor, to the kiln feeders. These are of the gravity type, of F. L. Smidth make, and are quite different from the usual "Ferris wheel" feeder. There is a trough containing a set of paddles by which the slurry is kept agitated, and a mechanism for keeping the slots through which the slurry is fed free from accumulations. The slurry flows through these slots under a constant head, and hence the amount fed may be simply regulated by varying the size of the opening. A device of Mr. Rinehold's invention furnishes a record of the amount of slurry passing, so that the production in barrels of finished cement is known for any moment or for any period.

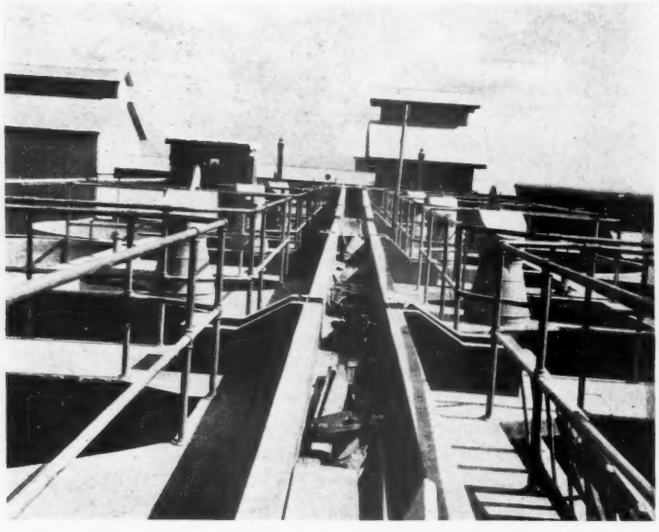
There are three kilns; two of them are 220 ft. long and 10 ft. in diameter for 55 ft., and 9 ft. in diameter for the remainder of the length. The third kiln is of the same length and has a 55-ft. section 10 ft. in diameter and is 8 ft. in diameter for the remainder of the length. This third kiln is fired with oil and is held now as a reserve, until the grinding capacity of the plant is increased. The other two kilns are fired with natural gas. All these kilns are of Traylor make and each is driven by a 75-hp. motor through a Link-Belt silent chain.

All three kilns are fitted with F. L. Smidth mixers, which are cross pieces placed in the kiln to break up the slurry and expose more surface to the heat. They extend about 30 ft. in from the feed end.

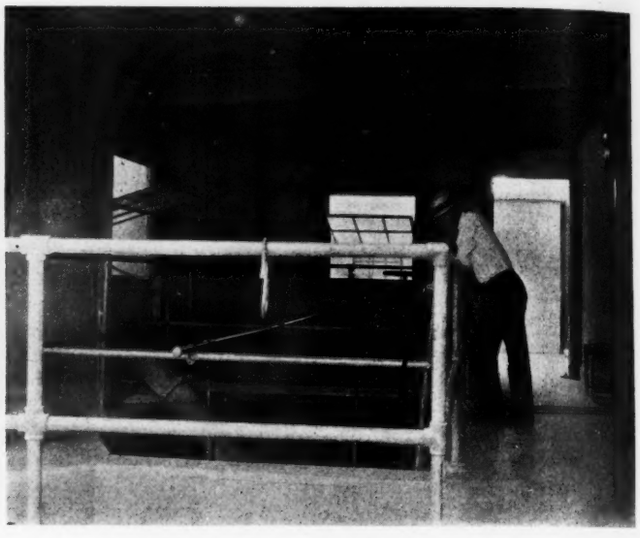
Natural Gas Fuel

The natural gas used as fuel is mixed with air and blown into the kilns by an American Blower Co.'s fan which has a 12,500-cu. ft. capacity. It is driven by a 50-hp. motor. In the beginning of the use of gas as fuel some trouble was experienced with the commercial type of burner that was tried. This burner had to be run for some hours before the kiln was hot enough to make clinker. Then a new tye of burner was evolved by putting in blades to give the gas and air a whirling motion and cross wires to cut the whirling stream and thoroughly incorporate the mixture, and since this was done the burning has been much improved. The consumption of gas has been lessened and the clinkerng zone is hot very soon after the burner has been started.

The consumption of gas at present is 1950 cu. ft. per barrel of cement, which compares favorably with the 12.5 gal. of oil per barrel formerly used. Owing to the high silica content the clinker is somewhat harder to burn than the clinker of some other plants, and the high moisture content of the slurry takes a great deal of heat to dry out. At present the slurry contains about 48% moisture, sometimes rising to 50%. With the harder rock from the quarry it may be brought down to 42%. With moisture con-

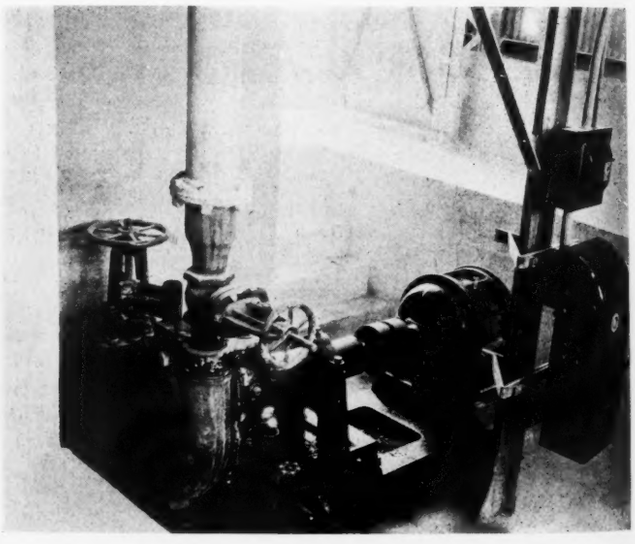


Top of slurry tanks showing the concrete distributing launders

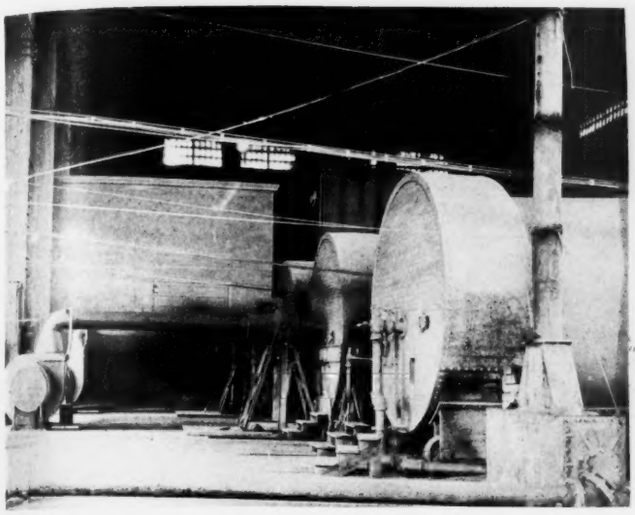


Looking into one of the large slurry basins

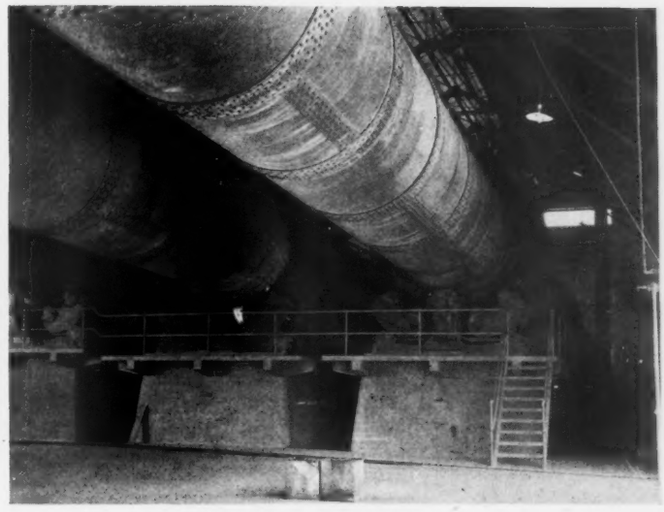
Under the slurry tanks. Note the globular shape



One of the slurry pumps and its drive and control



Kiln hoods. The nearest kiln is fired by oil and the others with natural gas



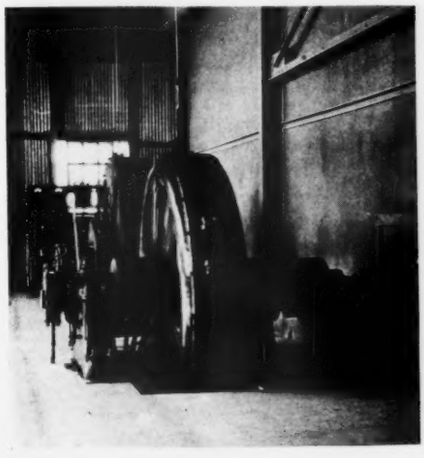
The kilns are 220 ft. long by 10 ft. and 9 ft. diameter—one is 10 ft. and 8 ft. diameter

tents of 33% to 34% equal to those found in plants where hard limestone is the principal raw material, the chalk and clay used here form a mud that can be cut with a shovel like clay, and which can neither be pumped nor agitated. When the high moisture and high silica content of the slurry are taken into consideration, the fuel consumption is considered very satisfactory. Stack gases have a temperature of 600 to 700 deg. F. and this is measured by a pyrometer as a check on the burning. The capacity is 1250 to 1400 bbl. per kiln per day.

The pressure on the air entering the burner is 9 oz. and the gas has a 1.75-lb. pressure.

There are no coolers. The hot clinker falls into a pit from which it is taken by a pivoted bucket carrier directly to the clinker storage. As it falls into storage it is sprayed intermittently from a hose. Then it is picked up by the crane and bedded in the storage pile so that it is thoroughly seasoned before it is ground.

An addition was being built to the clinker storage when the notes for this were made, and when completed the storage will have a length of 400 ft. It is 80 ft. wide and it is spanned by a 10-ton Shepard traveling crane which handles a 4-yd. Hayward bucket. The crane not only beds the clinker but takes it to the hopper of the finish grind mill.

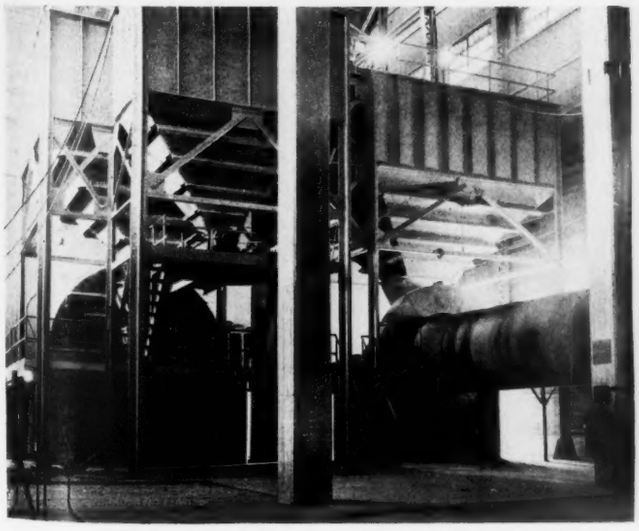


Motors driving the kominuter and tube mill

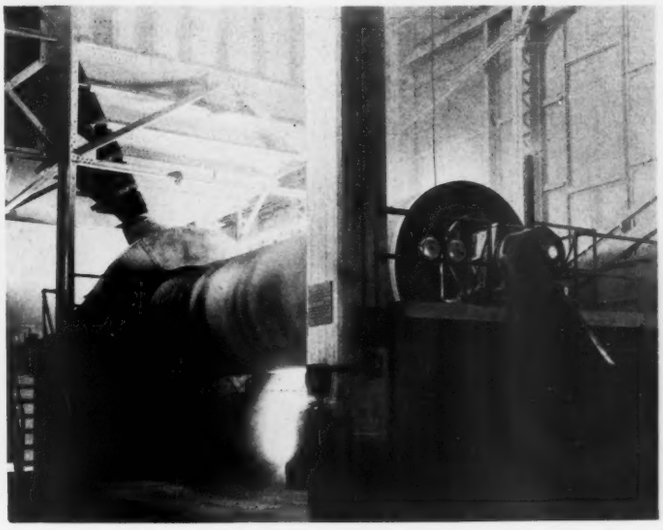
The finish grind mill has a No. 106 Smidth Kominuter, fed by the crane which carries a graduated charge of forged steel balls from 2 in. to 5 in., weighing about 2600 lb. It is driven by a 300-hp. super-synchronous motor. The discharge goes to a 16-in. conveyor belt 30 ft. long and then to a 16-in. elevator which raises it to the hopper of a 7x30-ft. Smidth tube mill driven by a 600-hp. super-synchronous motor. Grinding is carried in this to about 82% through 200 mesh.

A Traylor compeb finish-grind mill 7x45 ft. had been ordered and foundations for it were being placed when the plant was visited to obtain the notes for this article. This is to be driven by an 800-hp. super-synchronous motor and it will be fed by Schaffer poidometers for clinker and gypsum.

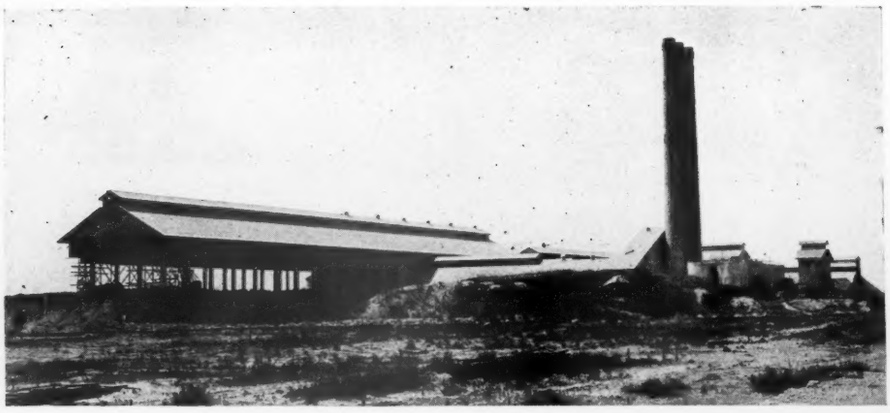
The system of transferring the cement from the raw grind mill to storage at the time these notes were made was through belt and screw conveyors and an elevator, but it is being replaced by two Fuller-Kinyon pumps which handle the cement in and out of the storage silos. There are ten of these



Kominuter and mill grinding clinker



Tube mill finish-grinding clinker



Clinker storage. The new addition under way will increase its length to 400 ft.

silos, each holding 5000 bbl. The packhouse at the end contains one 3-valve and one 4-valve Bates valve bag packing machines.

The power plant contains eight 4-cylinder solid injection engines made by the Rathburn-Jones Engineering Co. and sold by Ingersoll-Rand. Four of these were originally gas engines, and they have been converted by placing Diesel cylinders and auxiliary parts on the gas engine frames and crankshafts. The other four engines are new and were originally built as Diesels. In all, the plant has a total capacity output of 4000 hp. and it is the intention to add 1000 hp. more as soon as the new grinding units require it.

End of drag conveyor for clinker

Special Features of Engines

The cylinders are standard throughout in every way, so that they might be interchanged and so that a new cylinder of the standard may take the place of any one of them. Each cylinder develops 125 hp. and all the cylinders are adjusted to burn the same amount of oil and hence to develop the same power. The adjusting is by means of a Brown pyrometer to which every cylinder is connected. The feed to each cylinder is regulated until the pyrometer shows the standard temperature. This is checked daily to make sure of uniformity in each cylinder.

This checking engine performance by a pyrometer has been adapted from marine practice, but it might be profitably applied in every Diesel installation wherever much power is developed.

Two of the 4-cylinder units are connected to Crocker-Wheeler generators. The others are paired so that eight cylinders drive a single generator. All the generators except the two mentioned, and all the auxiliary equipment, such as the switchboard, are of General Electric make. All the motors throughout the plant are also of General Electric make.

The oil used for fuel is "Miranda crude," which comes from Laredo, Texas. The consumption of fuel oil runs from 0.36 to 0.37 lb. per horsepower-hour. The power plant is in charge of F. H. Rinehold, the son of the plant manager.

This power plant is one of the notable installations of the United States. It has been often mentioned in the literature of the manufacturers and referred to by technical writers and speakers. It was mentioned in a paper by H. A. Pratt, delivered at the Oil Power National Conference of 1927, as an example of the stability and serviceability of Diesel installations. In this paper it was said that the engines were run day and night without shutting down for 120 days, and that this was the regular practice at this plant.

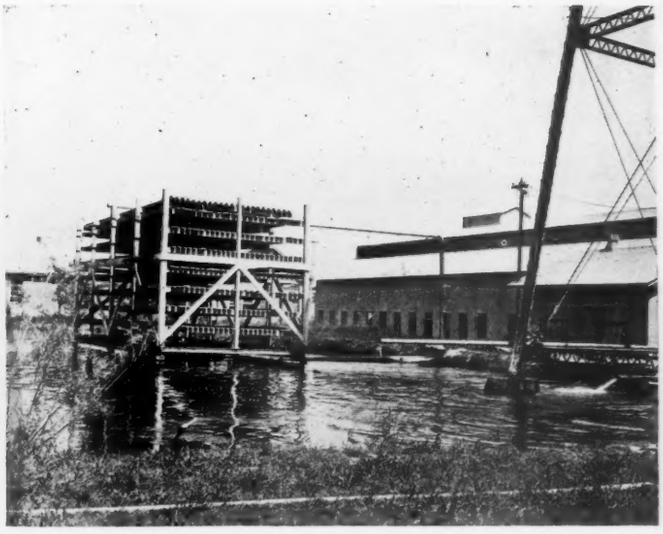
The 15-ton crane equipped with 4-yd. bucket handling clinker

The new laboratory is one of the finest and most completely equipped in the country and it occupies a handsome concrete building beside the office. Owing to the na-

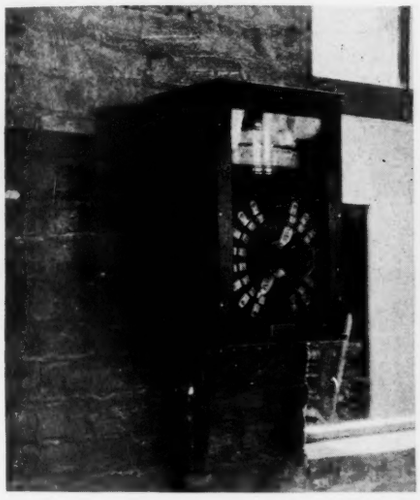
Ten storage silos provide for over 50,000 bbl. storage

The packhouse and storage silos

The power plant—one of the best in the country



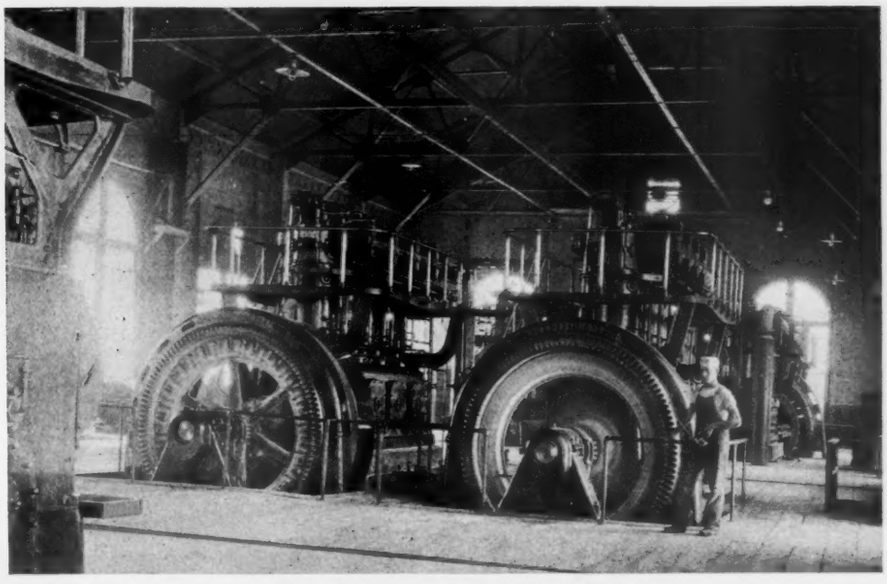
Cooling pond with the air lift discharging at the left



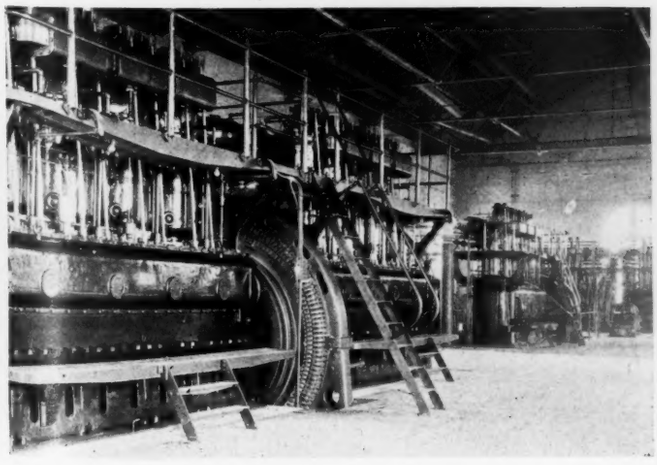
Pyrometer by which each engine cylinder is set to burn the same amount of oil

ture of the fuel used in the kilns and in the power plant, a considerable amount of work has to be done that the ordinary cement plant does not find necessary, such as analysis of natural gas and fuel oil. These fuels are analyzed regularly and tested for B.t.u.'s.

Each department of the laboratory occupies its own room. There is first an office, in which the balances are kept, then the chemical laboratory, and beyond this the physical laboratory in which the usual tests for soundness, tensile strength and the like are made. All briquets are made by "thumbing," while the mold is on a "Delimeter," a contrivance that shows a white light when the standard pressure of 15 lb. is reached and a red light when this pressure is ex-

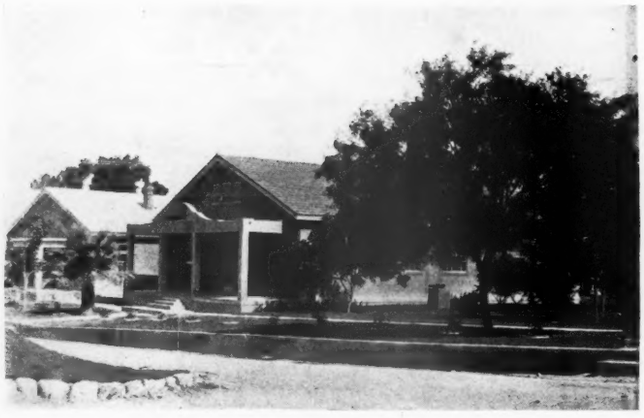


Interior of the power plant



A pair of four-cylinder units driving a single generator

Main switchboard within the power plant



The new laboratory building

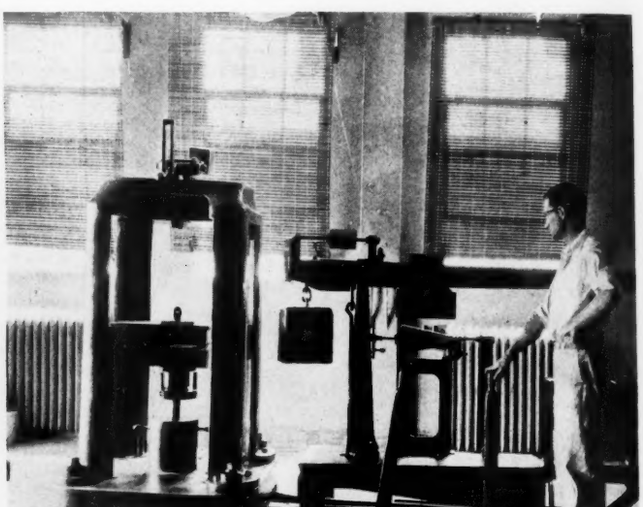
The office—a fine example of all-concrete construction

ceeded by any very considerable amount.

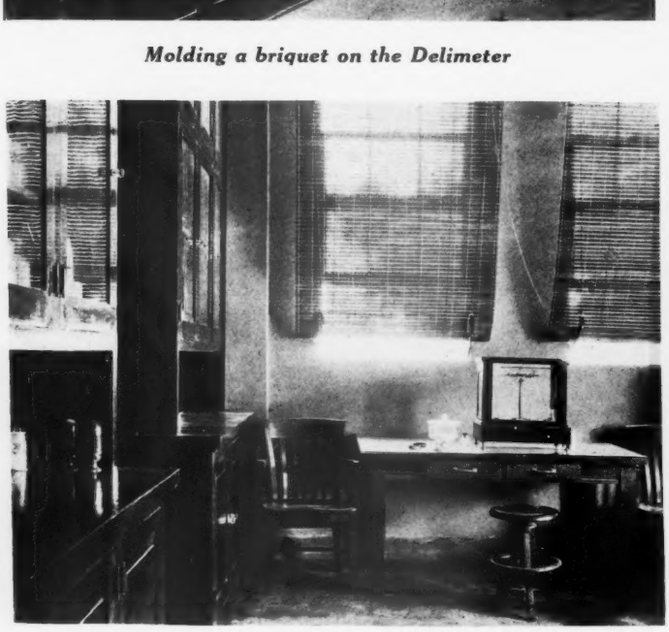
These rooms are on one side of the main hall. On the other side is a room containing a Tinius Olson machine for testing in compression up to 300,000 lb. Beyond this is a large room in which concrete cylinders are molded for testing and in which sieve analyses are made. There is a Ro-Tap sieving machine, and the usual balances, for this work.

In addition to the routine testing there is a great deal of testing done for the benefit of the larger users of the plant's product. This includes comparative testing with different aggregates and changes in grading of the same aggregate. The concrete block manufacturers in and around San Antonio have often availed themselves of the resources of the laboratory to find the most economical mixes which would enable them to produce blocks that would conform to the

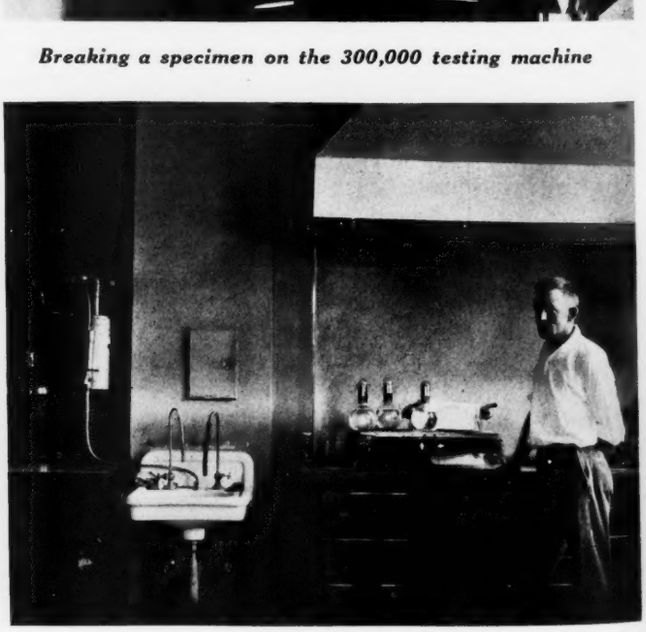
Molding a briquet on the Delimeter



Breaking a specimen on the 300,000 testing machine



Balance room in the chemical laboratory



G. P. Horn, chief chemist, in the laboratory

local city building code and regulations.

Safety and personnel work at this plant early received attention, and the work which gave it one of the first trophies awarded has not been let down. The green flag which indicates a no-accident month was flying from the flagpole on June 1 when the plant was visited. This work and the care of the grounds is in charge of S. F. Barrera, who has been with the company a number of years.

The president and general manager of the company is Charles Baumberger, and his son, Charles Baumberger, Jr., is vice-president and sales manager. A. Kronkosky is secretary and Charles Baldus is treasurer and purchasing agent. H. O. Rinehold is plant manager and George P. Horn is plant chemist.

Record Production of Cement in Canada in 1926

CONTINUING the increase in cement production recorded in 1925, a further advance to a new high record for the industry in Canada in 1926, is indicated by finally revised statistics just issued by the Dominion Bureau of Statistics at Ottawa. Shipments during the year amounted to 8,707,021 bbl., valued at $13,013,283, as compared with sales of 8,116,579 bbl. at $14,046,704 in 1925.

The Province of Quebec, Ontario, Manitoba, Alberta and British Columbia are the sources of the Canadian production. Nova Scotia was formerly a producer of puzzolan cement from blast furnace slag, but this has been discontinued in recent years. Quebec mills occupied the leading position in 1926 with a sales total of 3,727,377 bbl. Ontario mills came next with 3,398,860 bbl.; the Manitoba sales were 50.2% higher in 1926 than in 1925 and amounted to 612,155 bbl. British Columbia also reported an appreciable advance to a total of 544,863 bbl., and Alberta mills took part in the general augmentation of production with an increase of 7.05%.

The average selling price per barrel, f. o. b. plant, was at follows: Quebec, $1.22; Ontario, $1.41; Manitoba, $2.57; Alberta, $2.06, and British Columbia, $2.27.

Portland cement to the amount of 21,114 bbl. valued at $77,866 was imported into Canada during 1926. The average value of the imported cement in 1926 was $3.68 per bbl., while in the proceeding year the average was $2.89. Exportations of this commodity were recorded at 285,932 bbl. invoiced at $358,231.

The seven firms operating in the cement industry in Canada during 1926 reached a total capital investment of $41,380,000. Employees engaged in this industry during the year numbered 2,340, including 124 on salary and 2,216 on wages, their total earnings amounted to $3,052,662. Fuel and electricity costs reached the sum of $3,424,156, of which $2,675,162 was expended for fuel and $748,994 for electric power. Plant equipment included 1,166 electric motors with a total rating of 67,700 hp.

S. F. Barrera, in charge of safety and personnel work

Investigation of Feldspar

THE second progress report of the Bureau of Standards investigation of feldspar has been recently published in the June, 1927, issue of the *Journal of the American Ceramic Society*. The ultimate purpose is for the development of better ceramic products through a better understanding of the fundamental qualities of the raw materials of which feldspar is an important member.

The report contains among other things the results obtained by screen analysis and air elutriation, chemical analyses, softening range and point, etc., of the 19 feldspars used in the study. The results indicate:

1. The residue of commercial ground feldspar on the No. 200 sieve will vary approximately from zero to 7%, on the No. 325 sieve from 3 to 15% and by air elutriation (0.02 m.m. separation) from 32 to 55%.

2. Based on chemical composition, the feldspar may be divided into three fairly distinct groups.

3. The variation in screen analyses made independently by various laboratories may differ sufficiently to make specifications to closer than ±0.5% of little significance.

4. That differences in chemical analyses are sufficient to justify a more extensive and co-operative investigation to determine the cause and control of present variations and the accuracy which can be expected with recognized good analytical methods.

5. Results indicate that refractoriness increases, and the softening range decreases, with increase in K_2O.

6. Softening points range from that of cone 4 for soda feldspar to that of cones 9 to 10 for potash feldspar, and that average variations of one cone can be expected in the results of different laboratories, particularly when no single method is followed.

7. True specific gravity of crystalline feldspar ranges from 2.635 for a commercially pure soda feldspar to 2.572 for a commercially pure potash feldspar.

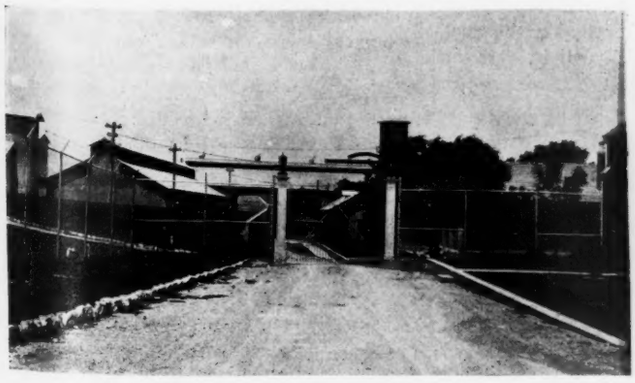
8. The porosity of "semi-vitreous" bodies is highest when using feldspars of intermediate K_2O content and the volume shrinkage of vitreous bodies decreases with increase in the K_2O content of the feldspar.

9. The feldspar has no discernible effect on the color of the body by reflected light.

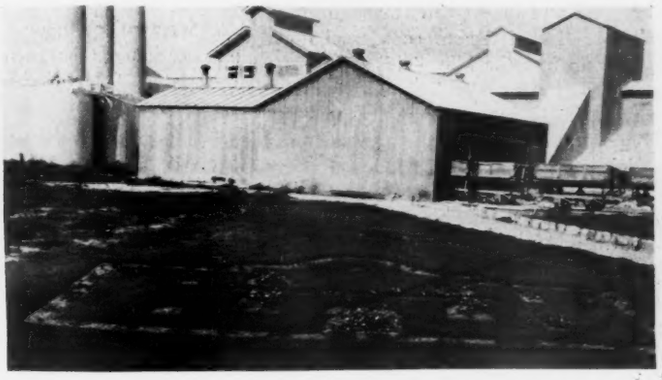
10. The translucency of vitreous bodies increases (Body No. 1 excepted) with increase in the K_2O content of the feldspar.

11. Mechanical strength is affected more by the method of firing than by the feldspar.

12. The thermal expansion is increased by rapid firing and by increased Na_2O content of the feldspar.



Roadway and entrance to the plant



The Alamo flower bed—one of Mr. Barrera's designs

Rotary Calciners for Gypsum

Progress and Experience Summarized

By J. Eklund

Formerly Process Engineer, U. S. Gypsum Co.,
Now Sales Engineer, Erie City Iron Works, Erie, Penn.

THE rotary kiln has not been applied to calcining gypsum as generally as it has to burning lime or to making portland cement. There are definite reasons for this which must be understood before the advantages of the rotary kiln for calcining gypsum can be appreciated.

In the first place, gypsum calcination, in comparison with lime and cement burning, is a low temperature process. The gypsum rock crystal breaks up between 300 to 400 deg. F., and the old-fashioned kettle boiling, like cooking food, has in the past proven quite satisfactory. Secondly, firing under a lid-covered kettle, where the settling stages of the powder can be observed, assures the operator of a product free from coal and soot, and of controlled calcination without accurate laboratory tests. A third reason, and perhaps the dominating one, is that until quite recently gypsum plaster manufacture has been accomplished in small quantities, by producers of limited capital; therefore the modest unit capacity and smaller investment cost of the kettle installation, against the larger and costlier rotary kiln, was very much in favor of the kettle process.

There is one more distinct reason why the rotary kiln for gypsum has not advanced parallel with the rotary kiln for cement and lime manufacture, and that reason is also inherent with the low temperature gypsum process. As the rotary kiln was applied to burning lime and cement first, it was natural that the gypsum producers should want to copy the practice without rationally modifying it to conform to the low temperature gypsum process. The fuel application is a typical instance. The fuel in the cement and lime kilns is fired directly into the revolving tube where the temperature of the refractory lining and of the cement and lime is high enough to support combustion of the suspended fuel for a long way up into the kiln. This does not obtain in the gypsum kiln. The temperature of the flame in the gypsum kiln is cooled down by cold radiation from the raw material and lining to a point where a portion of the fuel is dropped in the kiln, contaminating the product, and another portion comes out unburnt as black smoke.

With these comparisons understood, the advantages of a rotary kiln, properly installed and well operated, can be sought in the higher continuous capacity, lower fuel cost, lower power cost, lower labor cost, and less equipment to get out of order.

With the great advance made in the marketing of gypsum products, the tremendous increase in tonnage, larger capital invested, together with the lower costs of production constantly sought for, there can be no question that some kind of a continuous calciner eventually must replace the crude intermittent and inefficient kettle process to a considerable extent. If the rotary kiln can show a low ultimate cost with a uniform, uncontaminated product, its simplicity and ruggedness must command a foremost place as a gypsum calciner.

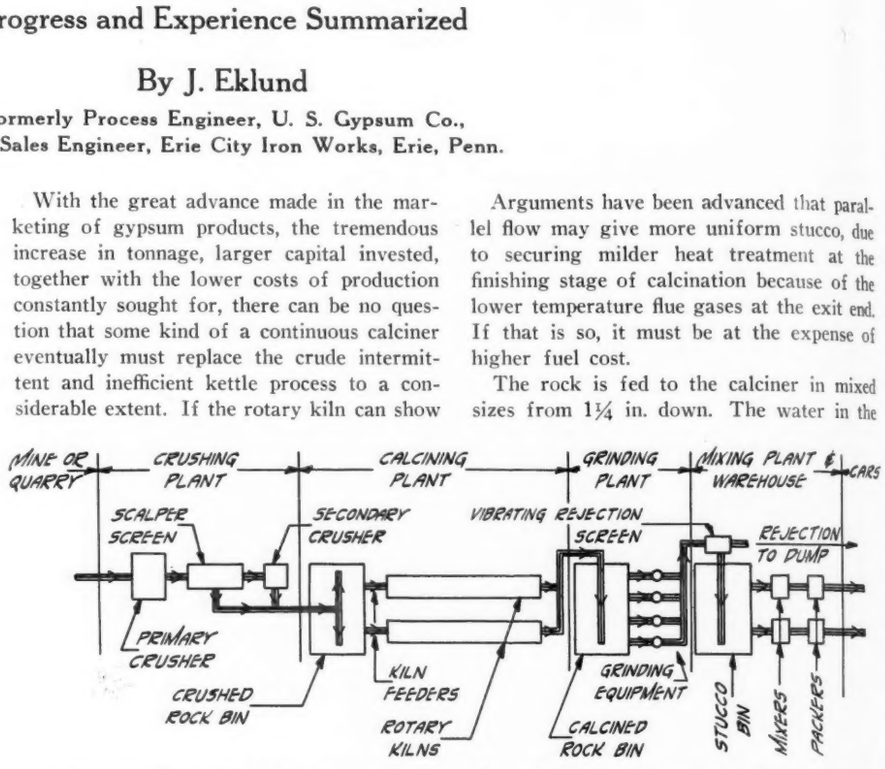


Fig. 1. Flow sheet for typical rotary kiln calcining plant of simple design

The Quality Question

The first question an operator will ask is: Can and has gypsum been calcined in a rotary kiln with acceptable uniformity in quality, with acceptable freedom from fuel contamination, and at a permissible ultimate cost. The answer is: It can and it has. The purpose of this article is to tell how it can be done.

The uniformity in quality is, in the rotary kiln, controlled by thermometers and the simple laboratory tests now generally used by all producers. The elimination of fuel contamination depends chiefly on the application of the fuel, which will be described later. The ultimate cost depends on the rationality of design, reduced fuel cost, and lower labor cost due to higher capacity.

Management of Flow

The rotary kiln takes the heat directly from the flue gases, and the question arises as to which is the best way to fire the kiln; from the feeding end—parallel flow—or from the discharge end—counter flow? Either arrangement is possible and has been tried, though practice is now with counter flow, which unquestionably is the best.

Arguments have been advanced that parallel flow may give more uniform stucco, due to securing milder heat treatment at the finishing stage of calcination because of the lower temperature flue gases at the exit end. If that is so, it must be at the expense of higher fuel cost.

The rock is fed to the calciner in mixed sizes from 1¼ in. down. The water in the center of the stucco coated larger pieces of rock is the last to be driven off. It takes high temperatures in the flue gases to do this rapidly; therefore in order to get a tolerably good capacity the flue gases at the discharge end must be high. The higher the temperature of the flue gas is, the higher is the fuel cost; also, the higher the temperature of the exit flue gases, the less is the work it performs, and in a way the capacity of the kiln is lowered with a consequent higher unit installation cost per ton of stucco. On the other hand, a counterflow calciner can have the flue gases leave the raw stone end around 400 deg. F., which is unthinkable for a parallel flow calciner.

Another difficulty with the parallel flow calciner is that the rock feeding spout located at the firing end is subject to the hot flame and is soon burned out unless special features of water cooling are resorted to. With the grading of the stone the same in either case, and with uniform firing, the control in the uniformity of calcination should not differ materially in counter or parallel flow. Fig. 1 is a typical simple flow diagram for a calcining plant.

Grading of the Rock

To burn lime in rotary kilns, which is the parent art from which comparisons with gypsum are made, it is found advisable to grade the rock before burning. Either two or three kilns are run in parallel on graded

rock, or one kiln is fed alternately with graded rock from two or three bins, with the real fines rejected.

Fines and mixtures of fines and coarse rock will slide on the side of the revolving tube instead of rolling over. As the rock slides the different sizes of rock will stratify, or segregate in different layers, the fines protecting the coarser pieces, and irregular burning results. The same conditions obtain in a gypsum kiln, though the process by far is not so delicate as with lime, and practice has not required the rock to be graded nor the fines below ¼ in. rejected.

To prevent the condition described above, possibly on account of the low temperature in the gypsum kiln, it is good practice to split the rock stream within the kiln by means of longitudinal steel plate diaphragms. The diaphragms are similar to the sectional plates in a cement or lime cooler. There is an added advantage in that the gas heated plates of the diaphragms assist in calcination, thus increasing the capacity and lowering the exit temperature of the gases; economy is gained in a double proportion. The rock should be crushed nevertheless to about ¾ in. and by a type of crusher that gives a minimum of fines.

Capacity

The total heat required for calcining gypsum, is small in comparison with that for lime burning. Therefore, with such a furnace as can be accommodated by the kiln area for passage of the flue gases, the capacity in tons per hour is much larger than for lime. In other words, the capacity is in the first place dependent upon the free area of the tube for flue gas passage. By assuming the following nominal conditions, the capacity for a given tube diameter may be arrived at. It is assumed that coal is used as fuel; that there are 20 lb. of flue gas entering the tube per 1 lb. of coal; that the gas enters at 2000 deg. F. and has a volume of about 60 cu. ft. per pound of gas. A nominal gas velocity of 20 ft. per sec. is permissible without requiring excessive draft. As the gases pass along the tube they will be cooled down and shrink in volume, but the moisture and vapor from the rock will gradually build up so as to compensate for the drop in gas velocity. The hot end of the kiln will have to be lined for about one-fourth to one-third the length with 6-in. fire brick, so as to make the free area 12 in. less in diameter than the steel shell. On these assumptions the different tube diameters can accommodate a furnace burning the amount of coal per hour shown in the accompanying table.

As will be shown under the heading fuel and firing, a ton of gypsum can be calcined with 75 lb. of coal. Taking that as a basis, the nominal capacity to be expected for each diameter tube is also shown in the table.

The capacity of the tube is also a function of its length, in so far as it allows the temperature of the flue gases to drop to a practical and economical limit to secure the fuel ratio mentioned above. If natural draft is used it is not practicable to let the temperature of the flue gases drop much below 400 deg. F., as the draft is reduced and condensation from the moisture at the upper end of the stack will build up dust cakes and reduce the draft further. How long the tube must be to secure a desirable temperature drop is a matter of experience. When the tube is equipped with diaphragms for about three-fourths its length, the proportions shown in the following table can be expected to come out right:

TABLE OF KILN CAPACITIES

Diam. of tube	Length of tube	Diam. of free area	Coal per hr.	Capacity per hr.
5 ft.	60 ft.	4 ft.	750 lb.	10 tons
6 ft.	80 ft.	5 ft.	1100 lb.	15 tons
7 ft.	100 ft.	6 ft.	1600 lb.	21 tons
8 ft.	120 ft.	7 ft.	2200 lb.	28 tons

Diaphragms and the low temperature process permit shorter kilns than what is required for lime burning. It is a definite saving in cost of equipment and building.

Fuel and Firing

The greater problems to be solved for success of a rotary kiln in calcining gypsum are connected with the fuel-burning application. Such problems are: Elimination of fuel contamination, control of uniform calcination, and good fuel and power economy.

That fuel and flue gas contamination can be eliminated to an acceptable degree is realized when it it borne in mind that common table salt nowadays is dried by the direct contact with flue gas. The refinements in furnace construction of salt drying are nevertheless not called for in gypsum calcination so long as the general principle pertaining to good combustion is adhered to. The great stride forward made in the last fifteen years in boiler and industrial furnaces should be taken advantage of to secure clean and complete combustion. The very first essential in that direction is allowing the combustion to take place in a separate furnace outside of the kiln. This is necessary, as the relatively cold tube and the cold rock is unfit to keep all portions of the flame above the ignition temperature of the fuel. Besides, if coal is used, the greater portion of the ash will also be kept out of the product. Fig. 2 gives an idea of how the furnace should be constructed.

To secure uniform calcination, it is obvious that uniform firing is called for. If oil is used for fuel and properly applied there can be no question of its satisfying this requirement. If, on the other hand, coal is used, the selection of burning equipment is between stokers and unit type coal pulverizers. Hand-firing is out of question, and the central station storage type pulverizing system is too cumbersome and costly to be considered. If a stoker is used, its type will depend a great deal on the kind of coal available. It is true that a stoker can be used and is being used, probably because the operators, having something to say, have been accustomed to a particular type of stoker and have faith in this type, while their experiences with a unit pulverizer improperly applied have been disappointing. There are, nevertheless, fundamental weaknesses inherent in a stoker which must be discussed.

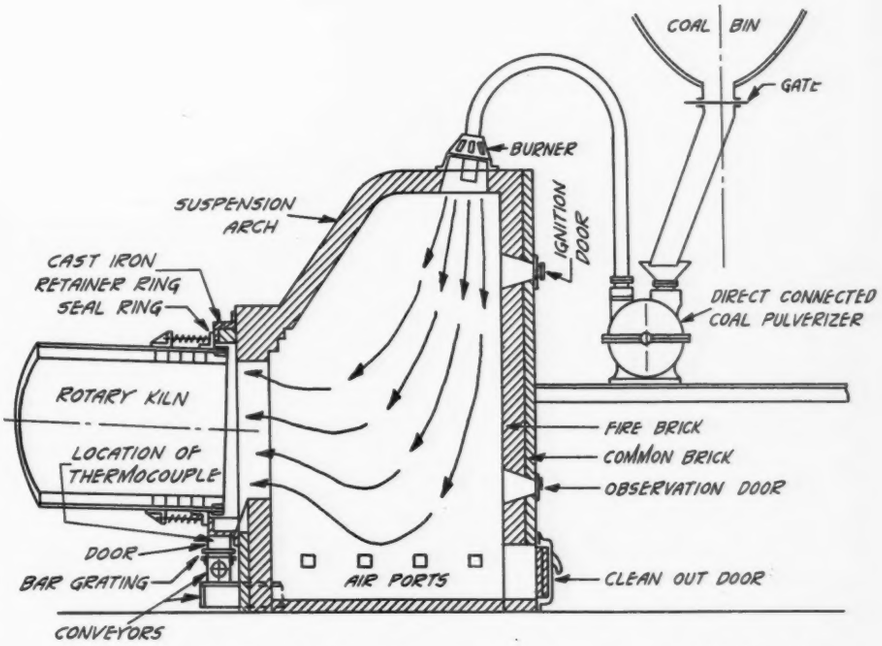


Fig. 2. Construction details of furnace for rotary gypsum calcining kiln

The drawbacks of a stoker can be appreciated when we have in mind that the heat to the calciner must be fed constantly and uniformly, that the fire should start rather fast and be shut off faster, as it is not infrequent that a calciner must be shut down for lack of orders, or for mechanical reasons of its connected equipment. A small stoker, no matter how well operated, will have pits and dead spots in the fuel bed, which periodically have to be sliced, re-

worked and ashes dumped; doors must be opened and closed; and the firing, air supply, and temperature of flue gases will be irregular. These characteristics of a stoker are permissible under a boiler with its abundance of water to accumulate and give off heat, much as a flywheel of an engine takes up and gives off energy; but the product in a calciner is more delicate and requires a more uniform heat supply. The stoker has a lot of coal burning, which is energy, but may be called momentum. It takes a long time to get up to normal speed and it is hard to instantly dampen the fire—put on the brakes—when the calciner must be shut down. These fundamental drawbacks of a stoker are practically eliminated with the pulverizer.

The argument against the pulverizer has been its newness, mechanical difficulties, and added cost of power. It has required rather moisture-free coal, with low ash content, and a furnace constructed with greater care to prevent the refractory from burning out and keep the ash from clinkering. The modern pulverizer—it makes little difference which one—is now in a good state of development. Its mechanical difficulties are now mostly ironed out, the repair and replacement of furnaces, cost per ton of coal is small, and its power cost is not much more than that of a stoker with forced draft fan. The unit pulverizer should for these reasons receive first consideration.

Returning to the selection of fuel, either oil or coal is suitable, and the selection should be based on a B.t.u. per dollar basis, with only a slight favor on oil because of its better control. The cost of equipment and installation comes out about the same when fuel oil storage, oil heater, pumps and piping are compared with coal storage and handling equipment.

To form a basis for the amount of fuel required per ton of calcined gypsum, the following constants and assumptions are tabulated, from which to carry out the heat balance. Coal is assumed to be the fuel. If oil is used or other conditions obtain, the heat balance can be modified accordingly.

Rock containing 3% surface moisture.
Water of crystallization driven off, 14%.
Rock enters kiln at 70 deg. F.
Gypsum leaves kiln at 370 deg. F.
Air enters furnace at 70 deg. F.
Heat of decomposition of gypsum rock = 38 B.t.u. per pound.
Coal heating value = 12,500 B.t.u.
Flue gas per 1 lb. coal = 20 lb. (This includes air leakage at seal rings.)
Flue gas and vapor leaves kiln at 400 deg. F.

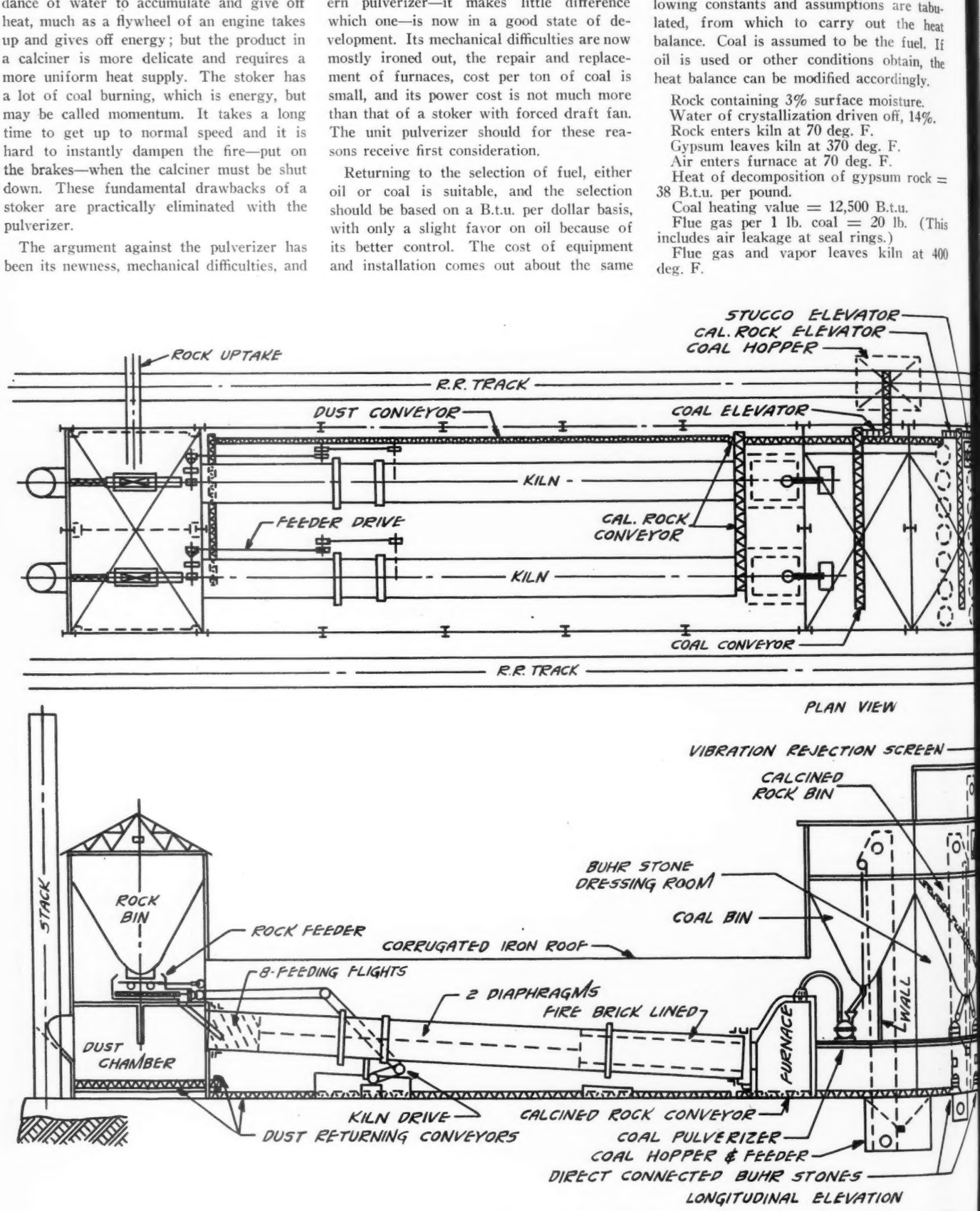


Fig. 3. Plan and elevation of a modern two-kiln gypsum mill. The

Specific heat of flue gas and air = 0.24.
Specific heat of gypsum = 0.26.
Radiation loss = 5%.

By carrying out the calculations in the heat balance it is found that about 60 lb. of coal are required per ton of calcined rock. In actual practice we may expect, and can get, a fuel ratio of 70 or 75 lb. of coal per ton of calcined rock, which is about one-eighth that required for a ton of lime, and a whole lot less than required for the gypsum kettle process with a rock dryer. With coal at $4 per ton the fuel will cost about 15 cents per ton of calcined rock.

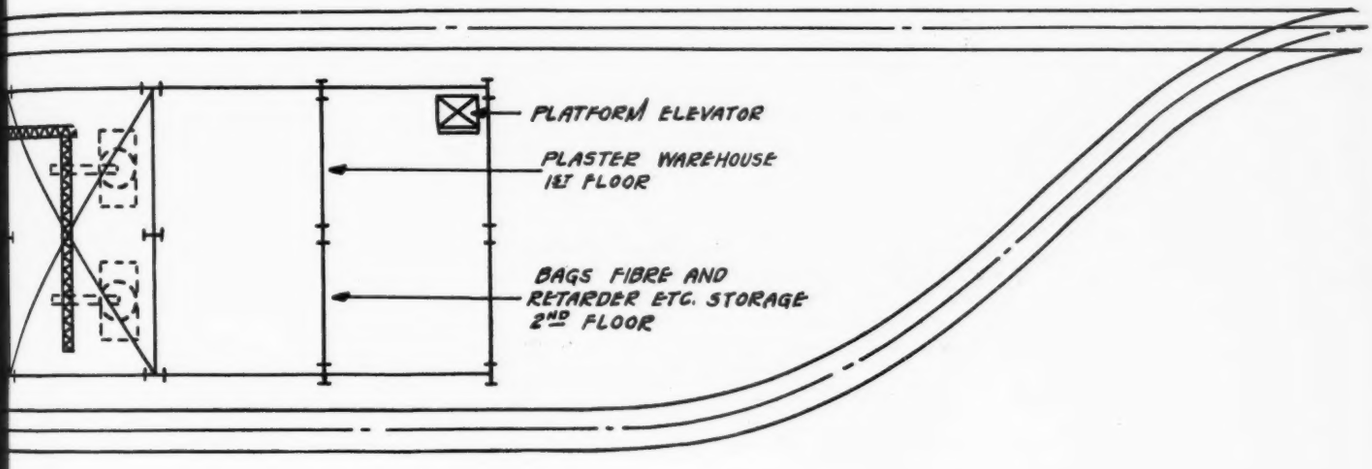
Application of Unit Coal Pulverizers

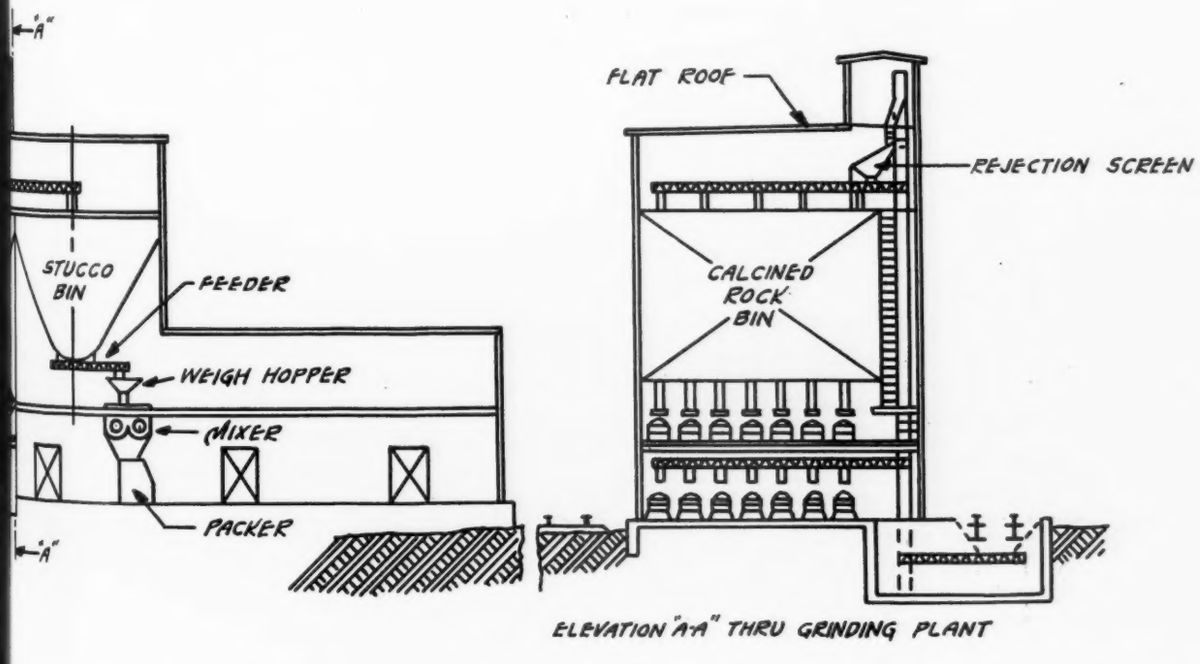
The unit pulverizer requires now a little further consideration. By assuming a nominal size rotary kiln of 20 tons of stucco per hour, a kiln will burn 1500 lb. of coal per hour, on the basis of 75 lb. of coal per ton of gypsum. Manufacturers of unit pulverizers will state that it takes about 18 kw.h. to pulverize one ton of coal having an average moisture content, and to a fineness of about 70% through a 200-mesh screen. The repair cost and replacement cost of hammers should be less than 5 cents per ton of coal. This amounts to about 1.3 cents per ton of gypsum. The suitable coal is slack or screenings, or coal crushed to 1½ in., with high fusing ash. The lower the moisture content of the coal, the better; but the pulverizer, being air-swept, will handle ordinary wet coal and partially dry it. A modern turbulent burner is desirable, as it gives a short flame and completes combustion in the furnace proper. To further insure against slagging of ash, the furnace should have a volume of 1 cu. ft. for each 1¼ lb. of coal burnt per hour, or about 1200 cu. ft. for 1500 lb. of coal per hour. Part of the air is sent through the pulverizer; the rest of the air comes in through the register of the burner or through air ports at the bottom of the furnace. The sketch, Fig. 2, gives an idea of the furnace arrangement. The latest and best practice should be incorporated in the furnace design.

Rotary Calciner Proper

The rotary calciner proper, aside from the inside diaphragms, is an ordinary revolving kiln such as used for cement or lime burning. It must revolve faster on account of its higher tonnage capacity, to make the stream of stone thinner. A speed of 1¼ to 1½ r.p.m. is practicable for a 20-ton calciner. The pitch or inclination should also be greater than for a lime kiln, for the same reason. A pitch of ⅝ to ¾ in. per ft. of length is in line with good practice. The calciner requires about 1 hp. per ton of capacity to drive it with its feeder.

The kiln should be lined with 6-in. thick fire brick for about 30 ft. at the firing end. A moderately high alumina brick should give good service. If insulating lining for the entire length of the kiln should be desired for heat conservation, it must be in-





ELEVATION "A-A" THRU GRINDING PLANT

diagram is drawn to scale and indicates the relative positions of the equipment

stalled with the utmost care in details, or the cost of maintenance will overbalance the fuel saving. Sil-O-Cel has been found to be a good insulating brick when it previously has been calcined to take out shrinkage.

To prevent the rock from building up and spilling over at the feeding end of the kiln it is necessary to equip the kiln at that end with cast-iron or steel spiral flights for about 10 ft. These flights should be about 9 in. high.

The rock feeder can measure the amount by weight or by volume. It should be accurate to assure uniform calcination. Good feeders can be purchased, though gypsum manufacturers like to design and build their own feeder. The feeder should be rugged and made with a large opening to the rock bin, so as to eliminate hang-ups of the rock. The feeder should be driven from the kiln so as to start and stop with the kiln, with a cut-out clutch to permit the kiln to run separately.

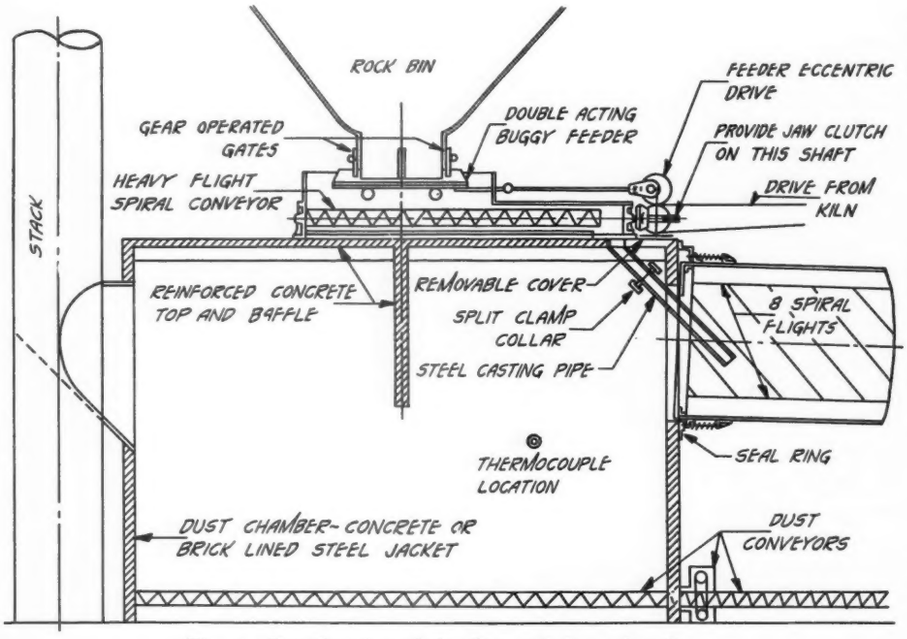


Fig. 4. Details of rock feeder and dust chamber

To secure the best in quality, fuel cost, and minimum repair to lining, the kiln should run with the fewest possible interruptions. Therefore the simpler the train of mechanical equipment connected with the kiln, the better is the insurance against breakdown. Such accessory equipment should preferably be a rock feeder, stoker or pulverizer, collecting conveyor, and elevator. Money spent in securing ruggedness of these pieces of accessory equipment will be saved in operating cost. Figs. 2, 3 and 4 give an idea of how the equipment should be arranged.

There is no good reason for attempting to place a dryer ahead of the kiln, as the calcining process itself is essentially a drying process. The fuel cost will go up markedly with a dryer installation. The surface moisture of mined rock will vary with the seasons, and the burning equipment can readily be adjusted for it. Quarried and surface-stored rock will require more adjustment.

Control Instruments

Two pyrometers, one placed in the exit flue gases, and another for the calcined rock to flow over, will form a good check on the calcination. These pyrometers check against each other. They should be placed next to each other in a prominent place so that the operator can easily watch them. Regular periodic laboratory tests should also be made. It is a good thing to have some kind of tachometer connected to the rock feeder to check the amount of rock going through.

Dust Collection

The amount of dust picked up in the flue gases depends on how heavily the kiln is forced. It pays to collect as much as possible of the dust, for it is of high quality and calcined in the high temperature gases, and it can be returned immediately to the calcined stream.

Simple or elaborate dust-collecting systems can be installed, depending on how much of a problem dust is to the vicinity of the plant, and on how much money is available for dust collection. For a natural draft kiln a simple dust chamber at the base of the stack is effective if the gas expansion volume is 8 to 1 or better. Elaborate mechanical dust-collecting equipments are very much more effective and can collect over 95% of the dust. They form problems all by themselves and require an induced draft fan to overcome their draft resistances.

Cost Data

The questions now arise: What would a rotary calciner plant cost? And what would be the production cost? These questions are impossible to answer without having a definite plant installation in mind, but a fair idea can be had of the general trend of these costs. If capacity permits, a two- or three-kiln plant is more economical than a plant having only one kiln, as the rock and coal handling equipment would cost about as much for a one-kiln plant as for a two- or three-kiln plant; besides, there is a proportionate saving in the building. One man can handle two or three well laid out kilns about as well as one.

With a modest design it should be possible to build a new 500-ton daily capacity plant having a 24-hour raw rock bunker; a 24-hour calcined rock bunker; a 48-hour coal bunker; all conveyors, elevators and feeders; pulverizer and furnaces; two kilns; building, and power and lighting, for anywhere from $300 to $350 per ton of daily capacity.

The operating cost would run about as follows:

COST DATA FOR 500-TON PER DAY PLANT

	Per day
Operating labor	$12.00
Maintenance labor	10.00
Power: Kiln, pulverizer, conveyor and elevators, 120 hp. at 1.5 cents	44.00
Fuel: 75 lb. per ton stucco at $4.25 per ton	80.00
Miscellaneous overhead	12.00
Total	$156.00

Or 31 cents per ton of stucco.

Comment on German Rotary Gypsum Calciners

By request from the editor of Rock Products the writer wishes to comment on the German practice of calcining gypsum in rotary kilns as described in Rock Products for August 20, 1927, and to compare their practice with American, and with our present understanding of the art.

There are several outstanding features in the German practice which are noteworthy. They are:

(1) Parallel flow of rock and gas.
(2) Regulating device at discharge end, so as to manually control calcination.
(3) Outside combustion chamber.
(4) Cell construction inside of tube.
(5) Comparative fuel and power cost.

The practice of parallel flow of rock and gas is, in the first place, undoubtedly a continuation of the old dryer practice; secondly, necessitated by the regulating device at the discharge end of the calciner. Strict demand for uniform quality, coupled with the rather small capacity—about 3½ tons per hour—and with irregularity in feeding and firing, on account of the small capacity, may have tied the German operators to this manually operated discharge gate and to parallel flow. The thermal efficiency in the parallel flow method is limited to the temperature of rock calcination—about 370 deg. F. The flue gas exit temperature must be a good deal higher to assure a worthy capacity. Much higher efficiency is achieved in a counterflow calciner with larger capacity and with calcination under proper control. Further, as shown in the sketch of the general arrangement, the heat oppression to work-

men by the lengthy conveyance of the hot gases in uninsulated ducts inside of the building, would become very objectionable with larger capacity kilns and with several in the same building. The smallness of their kiln capacity has spared them this worry.

The device for damming the discharge end and manually operating it to control calcination is entirely foreign to American practice. It is questionable if this feature will not fall away with larger production and with more uniform feeding and firing. Powdered coal would relieve to a great extent irregularity in firing.

To secure complete combustion, with the ash precipitated before the gas enters the tube, a rather large combustion chamber is provided. This, while only a perpetuation of the old dryer practice, assures an uncontaminated product and should be applied to either parallel or counter flow. The stack on top of the combustion chamber permits them to fire up and to shut down the calciner without materially disturbing calcination. The furnace, no doubt, is hand-fired. The small capacity does not seem to have warranted an automatic stoker or the use of powdered coal.

"Trickle Cell" Construction Suited for Small Capacities

It is interesting to see to what extent they have gone with what they call "trickle cell" construction in the kilns. With the limited capital and space at their disposal, it was natural that they should fully take advantage of the low temperature process and crowd in all the capacity possible into the smallest kiln. This was done by the construction of the "trickle cell" shown in the diagram. Someone may question if they have not carried this good principle a little too far. If made according to the diagram, it may give results at their capacity of about 3½ tons per hour, but by raising the capacity, in line with American practice, to from 10 to 30 tons per hour they would find that the larger flame and hotter gas will threaten the cell construction for some distance up the kilns. The greater volume of gas wants more free area and the gypsum rock less restrictions. It is not unreasonable to believe that larger capacity will make them reduce the cell construction to something like four diaphragms, with carrying flights as shown. The inside of the tube would then look something like the larger American calciners of the present time.

Calcining Costs High

"The larger the unit is, the higher is the efficiency," is a law that seems to hold in nearly everything. When read in the other direction it sounds, "The smaller the unit is, the lower is the efficiency." With a capacity of less than 3½ tons per hour, as mentioned in the article, it is nothing to wonder at that one ton of gypsum requires for its calcination 1,700,000 B.t.u. or 411 lb. of brown coal at 4100 B.t.u. per lb. basis, or 130 lb. of coal at 13,000 Bt.u. per lb. basis. Good performance on this side of the Atlantic will calcine a ton of gypsum for about half that amount The total cost of 68 cents per ton is accordingly high.

The electric power of 40 kw. for the complete calcining and grinding plant appears small when it is considered that the diagram shows seven conveyors, four elevators, one fan, two air separators, two pulverizers, besides the coal-handling equipment. American practice indicates that it takes about 10 hp. hours to grind one ton of calcined rock. If one-third of the product mentioned in the article is taken out by the air separators, there is still over two tons per hour to be ground, requiring over 20 hp., nearly the amount of power given for all the auxiliaries.

If the sketch is a fair presentation of the actual plant, and if the plant is a representative modern German rotary kiln plant, one is justified in saying that from the arrangement shown of the equipment, grouping of the drives, and proportioning of the bins, the German rotary kiln plant is still in the stage of development, with the American practice leading. It reflects the shop mechanic's idea of how to gently piece the equipment together so as not scratch the surface of cost too deeply, and it lacks the consistency and clear-cut boldness of well-proportioned design characteristic to modern American engineering.

Further Comments on Filters for Cement Slurry

Editor, Rock Products:

IN articles in Rock Products (May 28 and July 9)—A. B. Helbig and Frederick Wecke go into details of difficulties of filtering cement slurry containing clays and other colloidal material, and go so far as to say that it is impractical to filter cement slurries other than slag. However, these gentlemen would, no doubt, be pleased to know that there has been developed a small, highly efficient filter which will filter cement slurries containing clay or marl.

Filtration Engineers, Inc., have developed a filter which will filter even colloidal pottery clay, this being one of the most difficult materials to handle. One of these installations is described in the January issue of Ceramic Industry, and has for some time been in operation at the General Electric Co. This material is a fine colloidal clay and being very pasty could not be filtered on a filter employing heavy filter cloth.

The greatest difficulty to be overcome was to design the filter so that a thin non-clogging filter cloth could be used. All other filters must use very heavy filter cloth which in filtering colloidal materials, very quickly clogs up and puts the filter out of commission.

In most continuous filters, a filter drum rotates partly submerged in a tank of slurry. To remove the filtered material from the filter cloth, a scraper or friction device is used and it is this scraper that causes trouble. It smears the sticky materials into the surface and in addition wears out the filter cloth necessitating frequent and expensive replacement of filter cloth.

Briefly described, the FEinc filter consists essentially of a filter drum covered with filter cloth and made to revolve partially submerged in a trough of slurry. The filter cloth is connected to a hub-valve by a series of pipes through which the water is carried off to a suction pump. The difficulties from clogged filter cloth are overcome by ingenuously employing a porous belt or webbing to revolve around next to the filter drum and carry the de-watered material.

In tests recently run by the writer at the Ford Motor Co.'s cement plant direct comparison to a standard type continuous filter was made. A FEinc test filter picked up a de-watered layer of slurry ⅜ of an inch thick while the Ford filters produced a maximum of 1½ in. However, the FEinc filter was operated at 4 r.p.m. while Ford filters turn at one revolution in 11 minutes.

This figures out that, in the same length of time, the FEinc filter produces 11 times as much material per square foot of filter area. Roughly a 100 sq. ft. area filter would filter a larger tonnage than is now produced on the 1000 ft. Ford filters. In addition to the above, the thin layer of filtered slurry has 10% less water in it than the 1½ in. layer.

A canvas belt rides over the top half of the filtered drum and assists in pressing out additional water and it also densifies the cake and stops any inrush of air, thus accounting for the large reduction of vacuum requirements.

The Ford filters are each equipped wth 75 hp. vacuum pumps coupled with 12 in. piping while the FEinc, requires for this job, only 7½ hp. and 3 in. piping.

Increased production will result from ability of slurry to be ready at an ealier period for calcining. The slurry is delivered to the kiln in flake form without free water. Hence, on striking the hot gases of the kiln, the flakes are immediately seared and do not stick to the hot walls of the kiln or to other slurry flakes. In fact, you could see the cracks between the bricks. The filtered slurry travels as smoothly through the kiln as would a batch of gravel.

This condition was observed by the writer in looking down the slurry chute at the Ford cement plant. You could look through the chute into the kiln because the scroll, being found unnecessary, had been removed.

For coal economy, very long kilns are being built—some of them exceed 300 ft. in length. The same results can be obtained in shorter existing kilns by employing filters.

This is a remarkable advancement in continuous filtering and makes available to the cement manufacturers a small filter, low in price and operating lost and presenting no installation complications.

Filtration Engineers, Inc.
Elmer Rae.

Burning Lime From Marble at Knoxville

Quarry Waste from Cut Stone Operation in Vicinity Utilized as Kiln Stone by Most of the Lime Plants

THE marble quarries of Knoxville, Tenn., are very well known because the stone in cut and polished forms is shipped from them to every state in the United States and to European countries. These quarries are also the basis of a considerable lime industry, of much more than local importance. The marble is high in $CaCO_3$ content and burns well and finds its largest market in the paper and chemical industries of several states.

All the lime plants but one burn waste rock from the marble quarries which make cut stone. The Oliver King Sand and Lime Co. burns marble like the others, but it quarries its own rock. The quarry waste referred to is not spalls and the fine stone left from cutting. It is made up of large pieces, some of which will weigh as much as 10 tons; pieces which have to be taken out in quarrying but which are not of the right shape, or have not the right texture or structure to be used for cut stone. Naturally the quarry owner is glad to find a market for them, as they are expensive to dispose of as waste, and the lime man is equally glad to get so good a stone to burn without the expense and trouble of running a quarry.

Varied Composition

Apparently the marble varies somewhat in calcium carbonate content. At one plant it was said the stone burned contained 90% $CaCO_3$ with $MgCO_3$ less than 1%. At another plant where analyses are made frequently, and the character of the stone is important on account of the market supplied, the $CaCO_3$ content of the stone was given as 97% to 99% with $MgCO_3$ from 0.5% to 0.99%. Much of the product of this plant was sold under rather rigid specifications regarding the $CaCO_3$ and $MgCO_3$ contents.

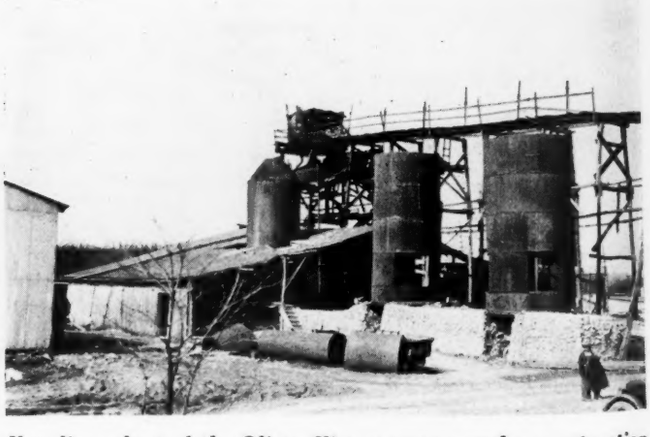
With raw material so easily obtainable and several companies competing for the market the price of burned lime is naturally low. The standard price quoted while the writer was in Knoxville last March was $6.50 f.o.b. cars at the plant. It was said that this was the lowest price for lime in carload lots quoted anywhere in the United States, but the same price was prevailing in El Paso, Texas, at least until recently. Anyway, it seems a very low price, especially for lime of such high purity.

For, while the stone is bought cheaply enough from the marble quarry, the expense of getting it into the kiln in the proper size for burning only begins with this purchase. There is a freight bill to pay, although the lime plants are usually quite near the quarries, and the expense of unloading these large

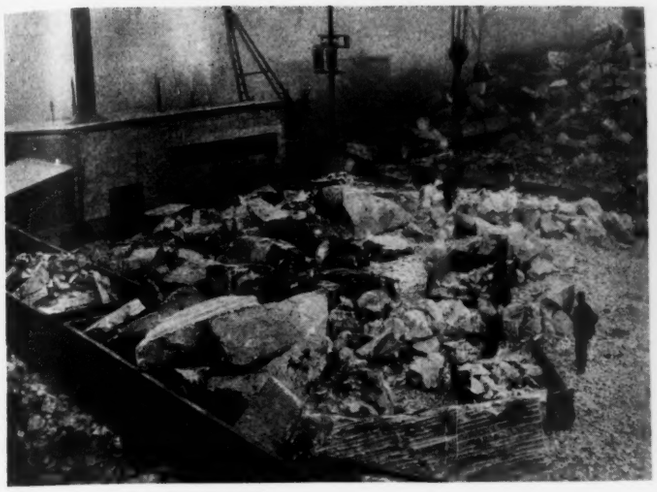
Quarry of the Oliver King Sand and Lime Co.—the only company which quarries stone for burning

Part of the Gray Eagle Marble Co.'s quarry showing a pile of waste stone in the foreground

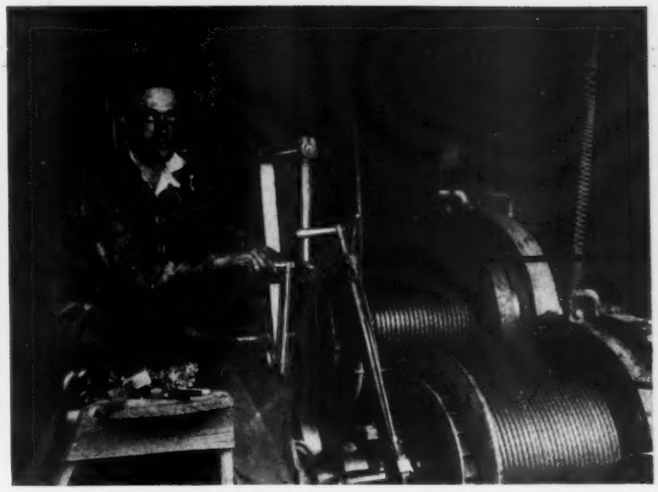
Old plant of the Oliver King company. Note the saddle chute for feeding the kilns



New lime plant of the Oliver King company under construction in March, 1927



Breaking quarry waste by "steel balling." The ball shows under the derrick hook



Hoist operator ready to drop the steel ball used in place of "pop shooting" for breaking boulders

pieces from the cars. And then the pieces must be broken down to kiln stone size. For unloading from the cars all the plants use a derrick of the same type used in the quarries. To break down the pieces to kiln stone both "steel balling" and "pop shooting" or block holing are used and each method has its strong advocates.

"Steel Balling" Practice

Steel balling, as practiced at the plant of the Knoxville Sand and Lime Co., consists

A "three-eye" kiln under construction at the Oliver King plant

in raising a steel ball weighing 2840 lb. with the derrick and dropping it on the piece to be broken. The ball is hung on a hook that can be opened by a pull on a line to release the ball. This is done by the hoist man, who works on signals given by the foreman of the yard. The height to which the ball is to be raised, and hence the force of the blow, is according to the piece to be broken, for it is possible to overdo the breaking and make an excess of fines. Pieces fly from steel balling about as much as from blasting so when the ball is to be dropped everyone runs to cover, usually under the body of a railroad car.

The advocates of pop shooting as opposed to steel balling point out that a lot of time is lost in this way. While it costs more to drill a hole with a jackhamer and load it with powder, there is a gain in shooting all the holes at once at a time when none of the workmen are in the yard.

Whether steel balling or pop shooting is employed, the final breaking to kiln stone size is by sledging. Wedges, or conical pieces of steel in a round hole, are used to break large pieces on the car so that the derrick can unload them more easily.

Nine inches is the preferred kiln size. Not many small pieces are fed to the kiln. Such smalls as are made in breaking are wasted, as there is not enough of them to pay to work them up into crushed stone.

Elevator raising buggies of stone to the charging floor at the Knoxville Sand and Lime Co. plant

Knoxville Lime Plants

There are several lime plants in and around Knoxville, but time permitted a visit to only three of them. Two of these had the "three-eye" and "four-eye" kilns which have long been a standard in the district and the third had kilns of a modern make fired with producer gas. This is the plant of the Williams Lime Manufacturing Co., which will be described in detail in a forthcoming issue.

There is another plant with kilns of a modern type in the district, that of the Carolina Fiber Co. of Canton, N. C., and Hamilton, Ohio. This is not a commercial plant and makes lime only for company use. There are four kilns which it is said were originally designed as mixed feed kilns of the type that has been so highly developed in France, using coke or coke and coal for fuel. These were afterwards converted to

"Bankite" blocks used for kiln eyes as set up in the warehouse

The six-kiln lime plant of the Knoxville Sand and Lime Co. The practice at this plant is typical of the district

producer gas firing and as the change was made under the direction of the inventor of the Mount kilns (W. D. Mount) they are usually spoken of as Mount kilns.

The first of the plants visited was that of the Knoxville Sand and Lime Co., about four miles from the city. Waste from the Gray Eagle marble quarry, one of the largest on the district, is burned. It is broken to kiln size by steel balling in the way just described. A derrick made by M. J. Savage and Co., of Knoxville, and a Lidgerwood steam hoist with 8x10 cylinders are used to unload the quarry waste from the cars and to handle the steel ball used in breaking the pieces.

Kilns at Knoxville Sand and Lime Co. plant

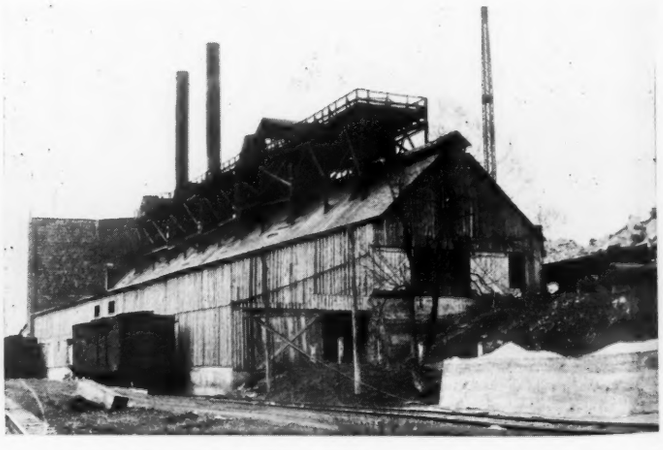
Kiln stone is loaded by hand into buggies holding about a ton and these buggies are raised to the charging floor by an elevator. Then they are rolled to the kiln and dumped in by hand. There are six kilns, four of which have three eyes. The other two are larger and have four eyes.

The smaller kilns are 8 ft. in diameter above the eyes and the shaft narrows to 5 ft. at the top of the kiln. The larger kilns are 9 ft. at the eyes, narrowing to 6 ft. at the top. Each eye is about 2 ft. wide and high and has grate bars 4 ft. long. Jellico coal, mined not far from Knoxville, is the fuel used and the firing intervals are 30 min. apart, according to the operating scheme adopted.

The lining of these kilns is of Harbison-

Williams Lime Manufacturing Co.'s plant—one of the most modern in the district

Modern plant of the Carolina Fiber Co.



Loading track at the Knoxville Sand and Lime Co.

Walker fire brick and a lining is reported to have lasted seven years. The eyes are lined with "baukite," a sandstone quarried at Oolewah, Ga., which is not far from Chattanooga, Tenn. This baukite is a comparatively new refractory and was promoted on a large scale about a year ago, when some tests of its refractory qualities were made before the American Mining Congress at the Memphis meeting. Its refractory qualities are good, but it is said to be too soft for kiln lining, where it must stand not only heat but the abrasion of the descending stone.

The kilns are set on concrete arches and the drawing floor is of concrete. The lime after drawing is cooled and then taken in wheelbarrows to railroad cars, if it is to be shipped as lump lime or to the crusher if it is to be hydrated. A good deal of lump lime is shipped in steel barrels.

The crusher is a No. 2 Austin and the crushed lime is hydrated in a Clyde hydrator. The hydrator discharge goes to a Raymond pulverizer with the usual air separation system and the cleaned hydrated lime is sacked for shipment by a Bates valve bag packer.

This plant was erected in 1920 and it is considered one of the best in the district, the construction being very substantial. The output is 500 bbl. per day or 45 tons.

New Plant for Oliver King Sand and Lime Co.

The Oliver King Sand and Lime Co. was constructing a new plant while the writer was in Knoxville and meantime it was opering the old plant which has six three-eye kilns. The stone is quarried near the plant, the face of the quarry being about 75 ft. high. Sullivan hand hammer drills are used and the face is worked in benches, usually six benches being made in the height of the face. The stone breaks well so that little pop shooting is required. Kiln stone is picked out by hand and the fines are sent to a small crushing plant where they are worked into crushed stone.

The method of feeding the kilns is somewhat unusual. The six kilns are set in two rows of three with a track on a trestle between them. On this track runs a 3-ton Sanford-Day car which is pulled up an incline from the quarry by a small hoist. The car may be dumped to either side of the track on a sort of saddle which has chutes leading both ways to the kiln, and these chutes are kept filled so that the stone runs into the kiln as it is needed. The new plant has five kilns instead of six, but something the same sort of feeding arrangement will be used.

A feature of the quarry practice that is unusual is the use of a turntable at the foot of the incline. The quarry tracks run out from this along the face of the quarry and the cars are pushed in by hand and then turned through a right angle to be pulled up the incline.

This plant also has a hydrating department and sells a large part of its production in the hydrated form.

Lime and the Fertilizer Dealer*

By J. B. Abbott
Consulting Agronomist
National Fertilizer Association

I CANNOT speak in any official capacity as a representative of the sales departments of the fertilizer industry. What I have to say is based upon my observation as a research, and later an extension, agronomist, a county agent, a farmer, and latterly an agronomist employed by the National Fertilizer Association.

I want to make the point at the outset that the fertilizer industry does not—nor in my opinion can the agricultural lime industry—depend to any great extent on the resident dealer, for the simple reason that he tends to be a mere storekeeper instead of a salesman, and in this day and age it requires real, aggressive selling to move the desired volume of goods. Let me, therefore, interpret "dealer" to mean the entire sales organization.

People whose business it is to sell fertilizer may be interested in the sale of agricultural lime for three or four main reasons. It may be for the profit in selling lime; it may be because lime makes fertilizer give better results, or it may be because lime makes farmers more prosperous and hence better customers for fertilizer.

The economic basis for the sale of lime and fertilizer is the same, namely, each material increases yield enough to pay for itself and still leave more *net* profit of crop per hour of labor. The cheaper the lime and fertilizer and the dearer the labor, the stronger the economic warrant to use them.

The consuming groups differ. Fertilizer is sold in New England, mainly—perhaps 70%—for tobacco and potatoes, neither of which crops use much lime. Ohioans use both, but mainly the outlet for lime lies among dairy farmers for production of more and better roughage, especially clover and alfalfa. Fertilizer people trying, with some success, to develope a significant tonnage in that field with sales appeal the saving in the New England $75,000,000 annual grain bill. Some of the difficulties in the selling lime to that trade are:

1. Dairy farmers are not very prosperous. They claim they have no money to spend, though they do have it and spend it—for grain.
2. Low acre value of dairy farm crops does not warrant any careless expenditure for soil amendments.
3. Returns from lime slower than from feed or fertilizer. Difficulty in financing for so long a time.
4. Dairy farmers not educated up to liberal expenditure for fertilizer.
5. The cost of adequate liming greatly exceeds the cost of usual or even heavy fertilization.
6. Fertilizer because of high unit value and small weight per acre-treatment can be stocked by dealers or ordered in off-seasons by farmers, as cost of rehandling of 200-400 lb. per acre-treatment is small.
7. Lime, because of low unit value and heavy weight per acre-treatment, can neither be stocked by dealers nor ordered in off-seasons by farmers, as rehandling 4000 to 10,000 lb. per acre-treatment is prohibitively expensive. Must move from car to land.
8. Because of the same low unit value and necessity of keeping acre-treatment costs down, lime producers are limited to low freight rate territories.

In conclusion: The extension service, the farm press and fertilizer sales people have sold the *idea* of liming pretty thoroughly. What is now needed is a sales organization to sell the *lime itself*—to get and pool neighborhood orders to make up car lots: to supply the push and the service that will get the name on the dotted line. I suspect that many local farmer agents under a competent traveling sales force may be the type of organization required.

*Paper read at First New England Lime Conference, Amherst, Mass., July 13, 1927. (See ROCK PRODUCTS, August 6, 1927.)

Expansion of Calcined Gypsum During Setting

THE expansion which occurs when calcined gypsum sets is one of its important properties. This property makes gypsum an excellent material for casting purposes, as it enables the material to give true reproductions of the mold. In some other uses this expansion is undesirable and is to be avoided if possible.

An investigation has been conducted at the U. S. Bureau of Standards to determine whether it is possible by simple methods to control this expansion. It was found that the expansion might be controlled within certain limits by control of the ingredients of plasters and of conditions of use.

An increase in the proportion of mixing water decreased the expansion. Using a given proportion of water, finely ground gypsum expanded much more than coarsely ground gypsum. With sand as an aggregate, an increase in the proportion of sand decreased the expansion, while a mix made with coarse sand expanded less than one with fine sand when the amounts of sand used were the same.

Retardation of the setting time had little effect on the final expansion, but caused an initial contraction, so that the final volume was less than that obtained with unretarded materials. Evaporation increased this effect.

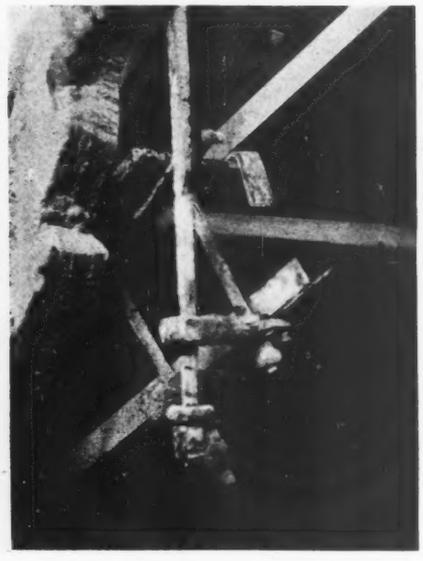
Variations in the time and temperature of calcination were tried, but these produced little difference in the expansion on setting. The use of certain admixtures decreased the expansion to a marked extent.

A report has been prepared giving in detail the results obtained. Announcement of publication will be made in the usual way in a future issue of the *Technical News Bulletin.—Technical News Bulletin* of the U. S. Bureau of Standards.

Hints and Helps for Superintendents

Simple Home-Made Screen

A SIMPLE "home-made" vibrating screen is shown in the accompanying picture which was put in as a temporary affair but which has lasted so well that it has remained in regular use for some time. It is in the silica sand plant of the Oliver Silica Sand Co., Massillon, Ohio, and it was devised hastily by the superintendent to take the place of a gravity screen, which gave trouble from blinding. On account of being in close quarters, it was only possible to photograph the working part on one side.



Vibrating arrangement on a "home-made" screen

The screen is hinged at the lower end. Below the screen frame (made of angle iron) a bar passes, extended beyond the screen on both sides. Holes in the extensions admit rods (only one of which is shown) and the upper end of these rods goes into eccentrics, which in this case were taken from the scrap pile. The rod has a nut and washer on the end as shown.

The stroke of the eccentric is longer than the motion of the screen. The rod raises from the lowest position (in which it is shown in the picture) and lifts the screen. On the descending stroke, the screen frame strikes a stop while the rod goes on. This gives the screen a bump, which is very effective in keeping the meshes open.

The screen is really a double screen, the upper screen frame being connected to the lower by two balls which show behind the rod. Being rigidly conected both have the same stroke and get the same bump.

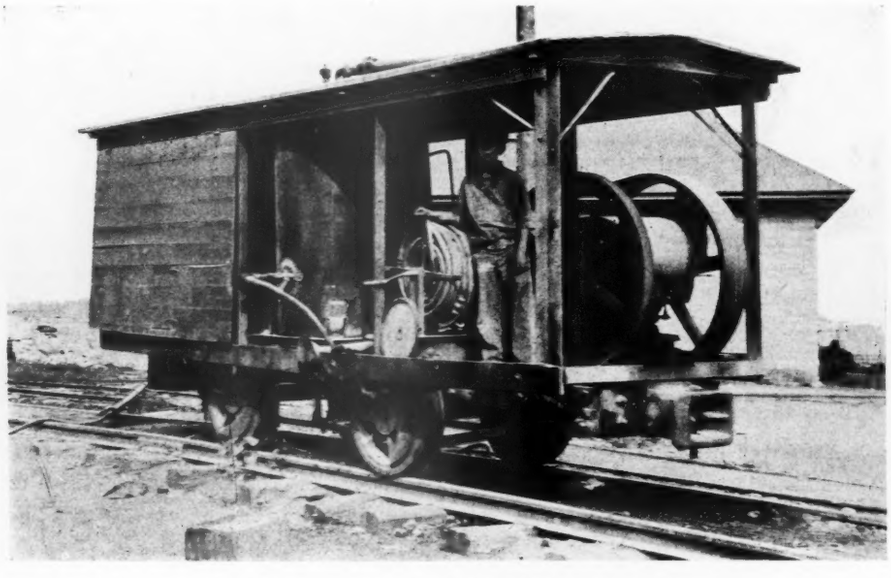
The service on the screen is light as compared with what it would receive in the ordinary stone or sand and gravel plant. For steady work and heavy duty any of the standard vibrating screens would probably require less repairs, but for a temporary arrangement or for light duty the device is sufficient.

Home-Made Portable Compressor

HOME-MADE portable air compressors are not unusual, but the use made of the one shown in the accompanying view is unusual. It is not used in the quarry for drills but for general repair work to operate pneumatic tools about the crushing plant.

The compressor is a single-stage Sullivan compressor belt-driven by a 30-hp. Allis-Chalmers motor. An old vertical cylindrical tank is used as a receiver, and in addition to usual compressor equipment, it has a reel for air hose.

The whole device is mounted on a home-made railway truck, the wheels of which are from a discarded steam dinkey. It is said to be a very useful machine. It was found at the plant of the Lehigh Stone Co., Kankakee, Ill.

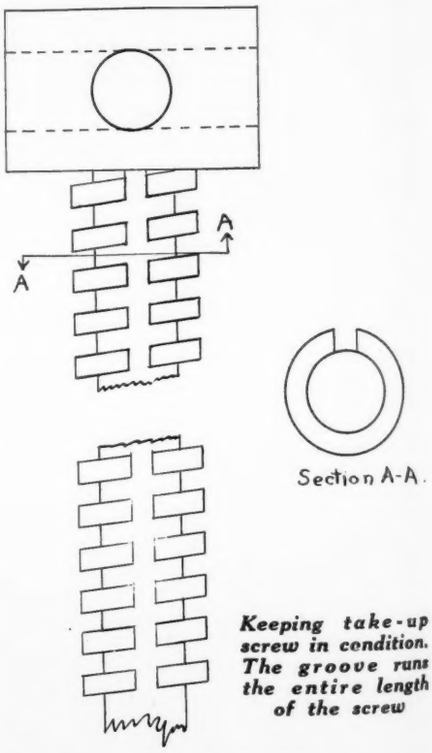


Portable compressor outfit made at the plant

Keeping Take-Up Screws in Condition

By W. L. HOME
Consulting Engineer, Pine Plains, N. Y.

HEREWITH is a little idea which I have found of great service and believe others will find useful in places often neglected in screening and crushing plants, though they are otherwise well maintained.



Keeping take-up screw in condition. The groove runs the entire length of the screw

Take-ups, particularly those with unprotected screws, located generally on inaccessible elevators or conveyor belts are usually the cause of much trouble when it becomes necessary to use them. In dusty, dirty places, grease or oil on a screw will collect dirt or dust until it is next to impossible to use the take-up until the screw has been laboriously cleaned by hand. If no grease or oil has been used, the screw is likely to be rusted in place and again impossible to use until it has been made free.

I have found the best remedy for all these conditions is first, to cut a groove the entire length of the screw. The groove to be as deep as the thread and about the same width. If the screw then gets "all gummed up," it is easily and quickly cleaned simply by turning the screw itself and keeping the groove clean. You will find that even when extremely dirty the take-up will turn and that the groove will allow the dirt to get away easily. If the groove is cleaned out the take-up will clean itself simply by turning it. Secondly, the take-up should be given a dose of graphite and oil and after the bearing has been adjusted wrapped with burlap or canvas to keep all dirt out. If all take-ups had grooves cut in them, were then treated with graphite and oil and wrapped with a suitable covering, there would never be any trouble in using a take-up that had not been turned for years.

What's in a Name?

AS noted in an article in ROCK PRODUCTS, April 18, 1925, the Dolomite Products Co., Rochester, N. Y., does not sell crushed stone. It merchandizes "Dolomite," according to the most approved methods of modern merchandizing. Profiting by experience in other lines of business, the president of this company, John Odenbach, appreciates the value of a name, a reputation, or whatever term you care to use.

The great majority of his customers probably do not know what dolomite is, at least few know it is quite a comprehensive geological term. But that does not matter. They recognize it as the name of a distinctive product they are familiar with. It means more to them than crushed stone, because in their minds, by "association of ideas," it means *John Odenbach's crushed stone*. They even may believe it has some special virtue, but that is more or less immaterial to the point of our argument.

The point is that here is a crushed-stone producer who has given *his* crushed stone a positive identity as distinguished from all other crushed stone. Which, considering the common character and rather low estimation such a commodity usually holds in a community, is no small achievement in merchandising.

Local advertising, of course, has played a part in this achievement, but the constant repetition of the word "Dolomite" in a certain distinctive type of lettering has been a large factor also. The word "Dolomite"—just that and nothing more—appears on all the trucks of the company, on the buildings, on all the equipment such as cranes and shovels, even on a mail box, as one of the views herewith shows.

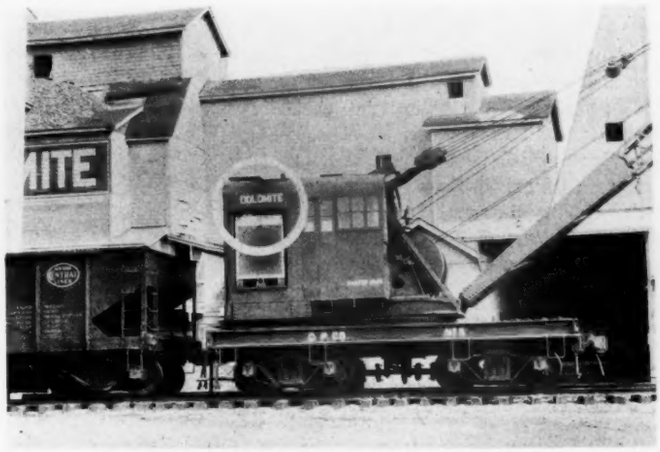
Even the mail box advertises "Dolomite"

Neat Arrangement for Coaling Dinkey

THE cut shows the arrangement for coaling dinkeys at the quarry of the Alabama Portland Cement Co., Birmingham, Ala. This quarry has the reputation of being one of the neatest and best kept quarries in the country, and the neatness extends to other matters than the way the rock is removed.

The coal bin is a light steel hopper on a wooden frame that may be set anywhere that it is required. The gate is at the right height so that the coal may be easily transferred to the dinkey. The chute is a metal pipe of light weight, opened out at the top so that coal may be shovelled into it easily. The alternative to this method is to let a quarry car down the incline have it pulled over to where coal is needed and then unloaded. Using the hopper is quicker.

There is nothing particularly novel about the arrangement except that it is somewhat neater and better made than hoppers that have been noted in other places.



The name "Dolomite" appears on all the company's equipment

Testing Rock-Drill Steel

IT is often necessary to make some sort of a comparison between drill steels which should be fair to the steel under test and also accurate. A simple and satisfactory method used by a large mining concern is described in a recent issue of *Engineering and Mining Journal*. The method follows:

An old rock drill is repaired and mounted permanently in a vertical position on a post in the blacksmith shop, and as an anvil a piece of manganese steel, usually an old crusher jaw, is employed. Four pieces of steel, each 4 ft. long, are used as samples for the test. They are inserted in the drill, one at a time, and pounded on the block until breakage occurs, the time for each piece being recorded in minutes and seconds. The break always takes place a few inches from the lower end, and then 2 in. of the metal is cut off the broken end to remove any fatigued metal, and the end is forged into a bit.

Coaling dinkies from a hopper bin

Sample drills are taken underground and placed successively in a rock drill and run until dull, a record of the footage being kept. The accuracy of the whole test depends on the air being kept at a constant pressure throughout both the block test in the blacksmith shop and the drilling test in the mine, although the pressures do not need to be the same in both cases.

The average time before breakage in the block test and the average footage before dulling while drilling indicate the toughness and hardness, respectively, of any particular brand of steel and form a basis of comparison between different brands, which is of assistance in determining purchases.

Safety in the Quarry Industry*

Report Presented at the 1927 Convention of the National Safety Council at Chicago

By W. W. Adams
Statistician, United States Bureau of Mines, Washington, D. C.

SAFETY in the quarry industry is a matter of direct concern to 92,000 men who are employed in the industry, and it is also of almost equally direct concern to their immediate families. Thus between 300 and 400 thousand people are personally affected by the accidents that occur in connection with the annual production of stone in the United States and in connection with the crushing and other work that immediately follows its extraction from the earth. From 120 to 150 of these men are killed by accidents each year, and 14,000 of them are non-fatally injured.

Collection of Statistics

Through the co-operation of the producing companies, the United States Bureau of Mines conducts an annual canvass of accidents and employment covering the quarrying of stone, and such subsequent work as crushing, rock-dressing, and the manufacture of lime and cement. This work began in 1911 and statistics covering the past 16 years are now available. These statistics are based upon reports furnished voluntarily by the producing companies on blank forms supplied by the Bureau of Mines. Each non-fatal injury reported to the bureau involves disability of the employe for more than the remainder of the day on which the accident occurred. In other words, the bureau's statistics are limited to what are known as "lost time" accidents. While many of these injuries cause the employe to lose only one or two days, some of them involve the loss of several weeks or months. Taking them in the aggregate, they average about 15 days per injury. Any company whose temporary injuries average less than 15 days each has a relatively safe plant, or is lucky, or is doing effective safety work. If deaths and permanent disabilities are drawn into the picture and given their customary equivalent weights in lost days, the average accident in the quarry industry represented a loss of 104 man-days in 1925 and 94 man-days in 1924. In this average each fatality and permanent total disability is considered equivalent to a loss of 6000 days and each permanent partial disability 800 days, the last named figure being borrowed from the reports of the Industrial Accident Commission of California until sufficient reports of this class of injuries accumulates in the bureau's records to develop a new average.

In addition to the bureau's annual canvass of accidents which is based on reports from all producing companies in all states, or as nearly all of them as we can obtain, a special and much more intensive inquiry into quarry accidents has been under way during the past two years. This study is based on full and complete records—a separate and detailed report for each accident—from a limited number of companies. Each of these companies employs at least 25 men inside the quarry. They are the companies that are participating in the National Safety Competition which is being conducted by the Bureau of Mines. Two such annual contests have been completed, namely, that of 1925 and that of 1926. One of the purposes of the safety contest is to determine which quarry has the smallest loss of time from accident in proportion to total man-hours of exposure. The quarry that establishes the best record receives a bronze trophy or statue known as the Sentinels of Safety, which is the gift of the *Explosives Engineer* magazine. Credit for providing the trophy and for very material aid in connection with the contest is due very largely to the enterprise of N. S. Greensfelder, the editor. The trophy is held for one year by the winning company, and is then surrendered to the winner of the next year's contest. Each year the name of the winning company is engraved on a pedestal of the trophy and each employe of the winning quarry receives an engraved certificate of honor issued by the Bureau of Mines and signed by the director of the bureau.

Value of Records to the Quarry Industry

The bureau's annual canvass of quarry accidents affords a broad picture of the accident situation as it affects the whole industry or any large portion or phase thereof; it also furnishes an annual account of the volume of employment required to produce the country's annual stone supply and of the total loss of life and limb, as well as the loss in man-days that went into the cost of producing the stone. The more detailed reports furnished in connection with the National Safety Competition are usually supplied as a carbon copy of the report which the company is required to send to its insurance carrier or to the state compensation commission. In this way the bureau is furnished with detailed valuable information on accidents with a minimum of inconvenience to the company.

It will thus be seen that the Bureau of Mines statistics of quarry accidents are collected by two methods from a common source, namely, the quarry companies. It will also be observed that the statistics differ in scope, geographically, and in the degree of detail with which the information is supplied. From these two sources of information and smilar information from other branches of the mineral industry, it is apparent that quarry accidents occur less frequently and cause a smaller loss of time in proportion to number of employes than do accidents at metal mines or coal mines. In other words, quarry work is not as hazardous as coal mining or metal mining, considering each of the three industries as a whole. Moreover, differences also exist between the hazard of different kinds of quarries. Perhaps the chief distinction in this respect is between quarries that produce dimension stone and those that produce non-dimension stone. Quarries that produce crushed or non-dimension stone have higher accident rates than those that produce dimension stone. For example, the fatality rate for the non-dimension group, in and about the quarry, in 1925, was 33% higher and the injury rate was 7% higher than the corresponding rates at dimension stone quarries; in 1924 the rates were respectively 76% and 18% higher. A comparison covering all years since 1916 shows that, without exception, the group rates for both fatalities and injuries have been higher at stone quarries producing non-dimension stone, the excess ranging from 5% in 1921 to 118% in 1920 for fatal accidents and from 1% in 1917 to 122% in 1921 for non-fatal accidents. Moreover, possible differences in length of work day at the two classes of quarries have no material effect upon this relationship. This is shown by figures which have been compiled for quarries working uniform shifts, that is, 8 hours, 9 hours or 10 hours.

Types of Accidents

In crushed stone or non-dimension stone quarries, where no care need be exercised to prevent breaking the stone, it might be expected that the rate from accidents from explosives would be higher than that in quarries producing dimension stone that is intended to be used for building or monumental purposes. This, in fact, has often been the case, as shown by the annual reports which the Bureau of Mines has received

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from the producers of stone. It does not, however, fully account for the higher frequency of accidents at crushed or non-dimension stone quarries. A comparison of the annual figures for the two classes of quarries during the past seven years shows that some other classes of accidents also, as a rule, occur more often at quarries that produce crushed or non-dimension stone. Crushed stone or non-dimension stone quarries show higher injury rates for accidents caused by handling rock at the quarry face, also for accidents from falls or slides of rock or overburden. Haulage accidents also are usually more frequent at crushed stone quarries. Accidents caused by falling objects, which records for earlier years showed were of more frequent occurrence at crushed stone quarries, have been materially reduced during the past four years, and in 1925 the crushed stone rate for this class of injuries was actually lower than at quarries producing monumental or building stone. A somewhat similar situation prevails as to accidents from flying objects; the rates for this type of accident have been high for both kinds of quarries, but during the past three years the non-dimension quarries have established the better record. Machinery accidents also are among the major causes of injuries at both classes of quarries, but in the past few years the crushed stone quarries have reduced their injury rates from this cause, and since 1922 these rates for machinery accidents have been lower than at dimension stone quarries. The net advantage, however, still lies with quarries that produce dimension stone; that is to say, the injury rates covering all classes of accidents combined is still lower for the dimension stone quarries.

Prevention a National Problem

Accident prevention is a national as well as local problem. It is therefore appropriate that national associations such as the Portland Cement Association, the National Crushed Stone Association, and others, should undertake or maintain some group action looking to the prevention of accidents. In 1925 more than 40 states contributed to the production of stone in the United States, and in more than 34 of these states accidents were suffered by men who produced the stone. To the extent that quarry accidents are similar regardless of location of plants, it would seem that the national associations might with advantage undertake a study of the accident prevention problem. It has already been said that the quarry industry is less hazardous than coal and metal mines, both as regards accident frequency and accident severity. This, however, is no more than might reasonably be expected, because nearly all quarry work is done in the open daylight, whereas most of the operations at coal mines and metal mines are conducted underground where the light, which is necessarily artificial, is often not adequate for maximum safety; also in the underground work there is the additional hazard of falling overhead material. The quarry industry should therefore not be content if it merely maintains an accident rate better than that for the mining industry, but should strive to lower its rate from its own previous levels. This has already been done to some extent so far as fatal accidents are concerned, but not to any material degree as regards injuries of a non-fatal character.

Of the 92,000 men working at quarries in 1925, the operators' returns to the Bureau of Mines showed 52,000 working in and about the quarry pits and 40,000 working at the outside plants. About three-fifths of the accidents occurred to the men working in and about the pits. These accidents accounted for 101 deaths and 8632 lost-time injuries. The fatality rates per thousand 300-day workers was 2.28 and the injury rate was 195. The injury rate was the highest on record since 1915, when the statistics for inside and outside accidents at quarries were first segregated. On the other hand, the fatality rates previous to 1925 were, in four cases, better, and in six cases worse, than the rate in 1925. These figures show that more progress has been made in the prevention of fatalities than in the prevention of injuries. A comparison of these figures with those for outside plants shows that more progress has been made outside than inside the quarries, and this fact has contributed favorably to the record for the industry as a whole.

Less Accidents on Full Time Operations

The number of days a quarry is in operation is largely a matter of contracts and weather conditions. Perhaps choice plays little or no part. Yet it may be interesting to know that it is apparently safer for a quarry to work full time than part time. That is to say, the accident rate per day diminishes as the number of days the plant is in operation increases. A quarry that is in operation a full year is likely to have a lower accident rate per day than if it worked only half a year. This conclusion is based on statistics which the bureau has compiled for metal mines, which indicate a relationship between accident rates and continuity of operation which doubtless exists in quarries as well as mines.

These statistics (as yet unpublished) of metal mine accidents show that accidents occur less often when operations are most continuous—that is, the accident rate declines as the number of operating days of the plant increases. This fact was indicated not only by the figures for all classes of metal mines combined, but also by the figures for individual groups. The combined rates over a four-year period (1921-1924) for fatal accidents among underground employes was 7.69 per thousand full-time (300-day) employes for mines operating less than 100 days per year, and it was 3.77 for mines operating 300 or more days per year. The non-fatal injury rate for the former group was 675 per thousand employes, while for the latter group it was 356. Considering mines of equal or similar size, the death rate for mines employing 100 or more men underground was 8.78 for 1 to 99 days of operation and 3.71 for 300 or more of operation. When the mines were classified according to principal product, it was found that iron mines operating less than 100 days had a fatality rate of 11.92 and an injury rate of 836, whereas those in operation 300 days or more had a fatality rate of 3.01 and an injury rate of 174. Similarly, copper mines had a death rate of 7.58 and an injury rate of 841 for less than 100 days of operation and a fatality rate of 4.09 and an injury rate of 435 for 300 or more days of operation. These figures for metal mines were for extreme groups in respect to operating time; rates for adjacent groups indicated the same tendency, but less clearly.

Similar figures for quarries have not as yet been compiled, but we hope to be able to prepare them in the near future.

Seasonal Variation in Accident Rates

The experience of 44 plants in the National Safety Competition of 1926 was classified on a monthly basis to learn the seasonal variation in the amount of exposure and the seasonal variation, if any, in the accident frequency rates. These 44 plants had a total exposure of 7,815,377 man-hours. The severity rates were also calculated on a monthly basis, but the occasional occurrence of a fatality, with its equivalent of 6000 days, rendered the severity rates too variable for comparative purposes. The volume of exposure, as might be expected, reached its lowest level during the winter—in January; it increased steadily through June, and held this level through July, then declined slightly but steadily through August, September and October, and continued to decline rapidly in November and December. The maximum exposure, in June, was 2¼ times that of January. The frequency of accidents was smallest during the four winter months of November, December, January and February; it was much higher in other months, the average rates being about 50% higher for the months of greatest activity.

Safety Rests with Operators

In order to form a mental picture of the field that lies ahead of any prospective safety program, it may be helpful to state that so far as quarry safety rests with the operators, it is necessary to reach only a small number of companies to encompass a large proportion of their employes. Less than 700 quarries employ as many as 25 men in the pit, and these 700 or less plants employ 80% of all men that work at quarries in the United States. If 50 men inside the pit are considered necessary to entitle a plant to rank as a large quarry, then such plants number less than 300 and they employ nearly 60% of the total quarry workers in the United States. These facts are referred to because the co-operation of the company as well as the employes must be obtained to make safety work effective. A relatively

small number of companies have it within their power to give a tremendous impetus to quarry safety work that will benefit 80% or more of the entire industry.

The accident rates for the whole quarry industry are but slight indication of what individual companies can accomplish. For example, the industry's accident severity rate for work inside the pits, as nearly as it can be computed from available records, was 8.202 in 1925 and 6.931 in 1924; the corresponding group for companies in the National Safety Competition was 7.599 in 1925 and 7.760 in 1926. Yet in the 1925 safety contest seven quarries out of 102 and in the 1926 contest 14 quarries out of 118 operated their plants the entire year without a lost-time accident. In 1926 sixty plants or 59% of those enrolled had accident severity rates of less than 1, and in 1926, 67 plants or 57% had rates of less than 1. Thus it is seen that the group average of 8.202 in 1925 and 6.931 in 1924 for the whole industry, and the National Safety Competition group averages of 7.60 and 7.76 respectively in 1925 and 1926, are by no means the best that individual quarries can do in the elimination of accidents to their employes. In fact, the 1926 contest showed that 97 plants or 82% of the total number of accident severity rates that were better than the group average; 21 plants or 18% of the total number had rates that were higher and therefore worse than the group average. This means that 18% of the companies were mainly responsible for the group average being as high as it was. Had it not been for the many good companies, the rate would have been much higher. The record, in fact, showed that the companies whose rates were better than the average had a group rate among themselves of 2.314, while the rate for those whose record was worse than the average was 38.695, 2.314 for the good companies, 38.695 for the bad companies, an average of 7.760 for both combined. The bad companies had a rate that was more than 16 times that of the good companies.

Ratings

The purpose of these and similar statistics is to make it possible for individual quarries to compare their accomplishments in accident prevention with what has been done by other companies. Any individual company may be remarkably successful in the elimination of certain classes of accidents and equally unsuccessful in combating other types. Neither the degree of success nor the degree of failure can be known without some standard of comparison. The National Safety Competition of 1926 has shown that while all of the quarries combined had a group rate of 7.760, yet 82% of them had lower rates than that figure. The rates ranged from zero to more than 200. Rates for the individual companies have been published, but in such a way that the identity of each company is concealed. Each company has been advised of its own rate and of its relative standing among all companies. Copies of a circular containing these rates are available to any company upon request. Incidentally it may be stated that the circular also contains the rates of coal mines, metal mines and non-metallic mineral mines. All of these rates have been calculated on a uniform basis and are therefore strictly comparable. The method of compilation is simple. Any company may easily prepare its own accident records in the same way. Those companies that see fit to do so will find that they are following a practice that has become standard not only in the mineral industry but in other industries as well. Following such a practice, any company may readily learn how it ranks with other plants of the same type or with any other industrial unit. It is hoped that the companies represented at this meeting may find it practicable to place their accident statistics on this standard and widely accepted basis. In the event that any company establishes a safety record better than those indicated in the National Safety Competition, the Bureau of Mines would appreciate it if the company making the record would inform the bureau of the fact. The bureau desires to learn of cases of this kind, so that suitable public recognition may be given.

Diamonds Used in Diamond Drilling

MOST of the black diamonds or "carbonados," usually called carbon, which are used in diamond drilling, come from the State of Bahia, Brazil, though some are also found in the State of Minas Geraes, according to the Bureau of Mines, Department of Commerce. They occur in gravel or conglomerate beds, which occur over a large area in these two states, and in beds of streams which have cut through the surface formations. Although they have been found in Borneo, they have been mined only in Brazil. The diamond reserves are supposed to be extensive, but their total area is not known.

Black diamonds range from stones of microscopic size to those weighing several hundred carats. The average size of black diamonds, as found, is probably 5 to 10 carats. The black diamond has a chemical composition exactly the same as that of the white stone, and its specific gravity ranges from 2.75 to 3.45. It is just as hard as the white diamond, which stands at the top of the scale of hardness, and is much less liable to fracture. In some parts of the district white and black diamonds are found together, although the larger yield comes from places where white diamonds are rare.

Black diamonds in their natural forms seldom have the size and shape suitable for diamond-drill work, and therefore must be broken before they can be marketed. Breaking diamonds requires judgment and skill to get the greatest number of stones of the right size and shape.

The bort, which is often used as a substitute for the black diamond, is an imperfect gem stone or white diamond, and sells for about 60 to 80% of the price of first grade black diamonds. It is fully as hard as the black diamond, but is a single crystal and fractures more readily. Borts may prove useful in oil well drilling.

A great many artificial substitutes for black diamonds have been suggested, but as yet, with one exception, none has proved satisfactory, for those with the necessary hardness are crystalline and break easily along the cleavage planes. Possibly some of the aluminum oxides, such as alundum, may have the required properties.

The number of stones needed for a bit depends on the size of the bit. The small bits used in drilling for ores are ordinarily set with six stones, although as few as two stones have been used. Large bits used in Europe for drilling large holes contain 40 to 50 stones. The stones used in metal prospecting ordinarily weigh 3 to 4 carats each, they have ample cutting surfaces and enough body to let them be firmly fastened in the metal of the bit. Stones of this size should not project more than 1/32 in. beyond the outside of the metal. When mud fluid is used with the diamond drill, larger stones which will project further out from the face of the bit will probably be needed.

Good diamonds have a dull vitreous luster, giving them a rather greasy, shiny appearance. Although generally black, they are usually tinged with red, gray, yellow and green.

Information in regard to the operation of diamond drills, with special reference to oil field prospecting and development, is contained in Bulletin 243, by Frank A. Edson, copies of which may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

Eugene A. Smith

DR. EUGENE A. SMITH, state geologist for Alabama, died on September 7 at Tuscaloosa, Ala., following an operation and an illness lasting more than a week.

Dr. Smith was born at Washington, Ala., on October 27, 1841. At the time the Civil War broke out he was a student at the University of Alabama. He received a lieutenant's commission in the Southern army and was later made a captain. At the end of the war he studied in Europe, and then returned to become professor of geology at the University of Alabama in 1871. In 1873 he was appointed state geologist, the position which he held until his death. As geologist for Alabama he performed much permanent and valuable work in the exploration of the great mineral resources of the state during his half century of service, and the reports he has left are of incalculable value to the state.

Accident Prevention and Production Efficiency in the Crushed Stone Industry*

Why Accident Prevention Should Receive More Attention by the National Crushed Stone Association

By Otho M. Graves

President of the National Crushed Stone Association, Vice-President and General Manager, General Crushed Stone Co., Easton, Penn.

SINCE the time when our sturdy Puritan forefathers landed on Plymouth Rock and fought valiantly and successfully the elements and hostile Indians to establish a foothold and a living place in the land they named New England, and when under fairer skies and on more fertile soil the cavaliers of old England established their colonies in what is now Virginia, this nation has flourished and prospered. With natural resources of almost unbelievable richness and seemingly unlimited in quantity, with a population growing by leaps and bounds, not only through a prolific birth rate, but enlarged steadily and constantly by immigration from the countries of the Old World, the tide of progress has continued to sweep westward.

Blessed with material prosperity and success, it has seemed as though the thread of our destiny has been woven into the fabric of world affairs by the hand of a fate graciously inclined to our needs and welfare, forming a part of that design known only to the Master Weaver. Nor is this prosperity confined to any small and fortunate class of our population; it is shared and enjoyed by the mass of our citizenry.

True it be that some fortunes have been amassed which would awaken the envy of a Croesus or Nero, thrown into strong relief by the dark shadows of poverty among a few as abject and misery-stricken as were the lower classes of France immediately preceding the French revolution. But these extremes present with us are limited in number and are the result of circumstance and opportunity seized by some and ignored by others, whether their failure be due to ignorance, laziness, drunkenness, inability or any of the other causes operating to prevent a successful grasping of the potential opportunities that confront us all in this nation, differing thereby fundamentally from the poverty of the serfs held in political and economic subjugation by a ruling class fattening in idleness on their labor. We have, as Gladstone pertinently pointed out, the froth and the dregs, but thank God for the good beer in between. In view of our living in these days when prohibition has come and largely gone, the thought of the glass of beer must be abandoned, though with reluctance.

With a continent stretching to the westward of the early settlers on the eastern shores, the western limit of which was not even conceived by them, it is not strange that the generations following came to believe that our natural resources were unlimited in extent. It is only in recent years, when we have spanned this 3000 miles of

Otho M. Graves

territory and planted cities on the Pacific coast rivaling in magnificence and in population those of the East, that we have come to realize that these natural resources must be conserved and guarded with jealous care if we are to continue to thrive and prosper. It is not so long ago when the phrases "conservation of forests," "of water power," "of coal," "ore" and other gifts of a beneficent deity sounded strangely in our ears. We have come now to accept such economy as a matter of course; and yet we have largely continued to overlook the conservation of the greatest of all material, mankind itself. Of all the material with which we have to work, there is none so vitally important nor so fascinating as the human.

Conservation of Human Life

Over its coffee cup the world reads the morning newspapers with horrified amazement as fatality after fatality is reported among the aviators daring the trans-oceanic flights, and asks that laws be passed prohibiting such a useless sacrifice of life, and yet complacently we go our way without giving thought that last year in the United States alone approximately 180,000 persons suffered accidental death and 7,500,000 endured casualties that did not result fatally. Those daring aviators risking their lives in the cause of science and human progress bear that relation to this age as did Columbus, Magellan, De Soto and others of their courageous faith to an era past and gone. Our pride in achievement responds with a thrill to the accomplishment of such men, but we can see nothing more in industrial accidents than sordid carelessness on the part of the employe or almost criminal lack of interest on the part of the employer, with possible resultant poverty, misery and mental anguish to the family of the injured one.

A relatively new thought is manifestly permeating industrial activity—the recognition of the interdependence of employer and employe, a relationship which now approaches economic equality. We are beginning to recognize beyond a mere lip statement to that effect that the employer prospers in direct ratio to the prosperity of his employes. Industry is demanding a new type of executive, one who not only intimately knows the processes of manufacture, but who also sympathetically visions and understands the problems which confront his men, one who while directing and governing creates in those associated with him enthusiastic co-operation; in other words, a leader, and not a boss, one whose integrity, qualities of judicial fairness and human sympathy awakens and holds the confidence of his men. To such an executive the physical safety of his men is of paramount importance. He is motivated in safeguarding them in their employment no less by reason

*Paper read at National Safety Congress, Chicago, Ill., September 28, 1927.

of their economic value, impaired as it is by lost time from any cause, than by his humanitarian interest in their welfare and contentment of mind.

A contented worker is obviously of more value than one discontented and disgruntled, whether his disturbed state of mind comes from a belief that he is underpaid, unappreciated or unduly exposed to unnecessary hazards. We have outgrown the moral crutches evidenced by such phrases as "Business is business," "Honesty is the best policy," and "Caveat emptor." We now clearly perceive that business is good business only when it is conducted along sound, ethical lines. We are honest because we know that we should be, and the values of honesty come as by-products. The buyer is not expected to beware, but is protected, and so should be the worker.

Economic Justification of Accident Prevention

Is the time and money required to promote accident prevention in any particular plant economically justifiable? The answer to this question is in the handwriting on the wall, with abundant proof of an affirmative answer to the query in the experience of our largest industries. The evidence is overwhelming that a safe plant is an efficient one, and conversely, an efficient plant is a safe one. It is being constantly demonstrated that by giving due attention to accident prevention, insurance costs, however carried, are lowered; and, moreover, production is correspondingly increased.

The Committee on Safety and Production of the American Engineering Council has just completed its study of the relationship between industrial safety and production. Some of its conclusions, after the most exhaustive and thorough study ever given to this subject, confirm the beliefs held by some of us and are startling to those who do not yet share them. There is detailed material in the report of the committee to support the statement that maximum productivity is dependent upon the reduction of accidents to an irreducible minimum, and that there is such an intimate relationship between safety and production that it is impossible for a plant to continue to increase in productivity unless it reduces at the same time is accident rates.

Not so long ago a well known producer of a mined material was quoted as saying that he would not sacrifice production for the sake of reducing accidents in his mines. Such an attitude would be humorously paradoxical were it not tragic. In discussing the incident the memory whimsically came to mind of an old negro who said that on his farm in Southern Georgia he used to raise horses, black horses and white horses, but that he had to give up raising black horses because they ate more than did the white horses. When asked why this was so, he said, "Ah can't ezactly account fo' it lessin it is that ah had mo black hosses than ah had white hosses." The logic of the manufacturer and of the old negro is equally unconvincing to the enlightened executive. It seems almost self-obvious that a clean, neat, safe plant, factory or mine in which the employes contentedly work under conditions as pleasant as the circumstances of the work may permit is necessarily more efficient and richer in productivity than one of which the opposite is true.

Though it is generally recognized that a reduction in the number and severity of accidents is reflected in lower insurance costs, however the insurance be carried, this is not the only nor even the largest financial saving. The Travelers Insurance Co., of Hartford, analyzed 5000 specific accident reports drawn at random from the claim files of that company, disclosing the almost amazing fact that the "hidden" cost of accidents is four times the direct or insurable cost.

In this item of "hidden" costs such factors were considered, weighed and estimated as lost time of injured employe, time lost by other employes who stop work out of curiosity or sympathy to render assistance, time lost by foremen and superintendents in assisting the injured one, preparing accident report, attending hearings before industrial commissions, injury to machinery or property as the result of the accident, interference with production, the less effective work of the man replacing the one injured and other factors which suggest themselves but are too numerous to mention.

While this ratio of the hidden cost to the insurance cost may not be four to one, as analysis of these 5000 cases would indicate, it is at least something to one, and that something is too much. It is reasonable to believe that intelligent and organized effort to prevent accidents, both as to number and severity, results in lower insurance costs, even greater reduction in the hidden cost, difficult to estimate, and increased plant efficiency due in part to the improved morale of the worker. But for such endeavor there is yet another reason, either stronger or weaker, dependent upon one's ethical conceptions, and that is the obligation resting upon each of us to do his part to prevent needless suffering and privation.

Humanitarian Considerations

It is not the intent of this discussion to enter into the various phases of the relation of employer to employe, nor to consider the several factors tending to produce that harmonious and sympathetic accord which alone can develop the fullest potentialities of any industry. That a human, intelligent and sympathetic interest on the part of the executive of any business is a factor in creating a responsive spirit on the part of the other workers must be admitted. While the paternalistic attitude may be resented, the kindly personal interest of the executive makes a direct appeal to the heart and head of the rank and file of labor. Assuming then that accident prevention is worth while from the several points of view upon which we have but lightly touched, there remains only to consider briefly ways and means for accomplishing the desired purpose.

The Present Attitude of Crushed Stone Producers

With the thought that it would be both interesting and illuminating to ascertain the attitude of mind of quarry producers throughout the country as to accident prevention, a questionnaire was submitted recently to the members of the National Crushed Stone Association inquiring as to certain phases of this work as conducted by them. The response was generous and prompt. Certain of the information received in that manner seems sufficiently interesting as to be worthy of comment.

Some 60% stated they were not members of the National Safety Council, and of the remaining 40% holding membership, the average life of the membership is three years. The non-members were asked to state their reasons for not joining. Of these 16% replied that they did not believe membership in the Council would sufficiently assist in plant safety work to warrant their joining. The membership of 35% has not been solicited in any manner. The literature concerning the value of membership and the work of the Council has not been sufficiently interesting or appealing to obtain the membership of 7%. The other reasons were scattered, although tending toward an indication of unfamiliarity with the aims and purposes of the Council.

In reply to the question if membership in the National Safety Council was of value and if so, in what ways, such statements were received as, "It is worth while being associated with others in the safety movement," "Stimulates interest in safety and keeps one informed as to accident prevention," "In securing reliable data and information as to safe practices, as well as assistance personally rendered by safety officials," "Through safety posters and magazines."

It may be concluded from these replies that crushed stone producers to a much greater extent should hold membership in the National Safety Council, and a fair inference is set up that the responsibility for the present low percentage of membership must be shared in part, at least, by the Council itself, due to the fact that the membership of so large a percentage has not been solicited in any manner. While it is not our intention to presume to suggest methods to the Council, it is commonly recognized that personal solicitation is far more effective than correspondence: but every member of this industry should be invited by letter at least to join the Council, even if at present personal solicitation is not feasible.

An even lower percentage of our membership is enrolled in the National Safety Competition, namely, 27%. Of the 73% not enrolled, some of the reasons are as follows: "Negligence," 10%; "Do not believe that

entry in the competition would be of assistance," 14%; "Operations too small," 17%.

Other scattered reasons, each having a low percentage, are: "Too much clerical work entailed," "Not familiar with it," "Didn't know there was such a contest," "Safety organization too young to compete with credit," "Intend to join next year," "Not located in the United States."

As a respectful suggestion to those conducting the National Safety Competition, it is worth consideratoin, in view of so high a percentage reporting their plants are not sufficiently large to be eligible, that it might be well to lower the requirements in this regard, as accidents occur in small plants as well as in large ones, and also possibly to render the Canadian producers eligible, as there are a number of members of the National Crushed Stone Association located in Canada.

Of those entered in the competition, all replied that they had noticed increased interest in accident prevention as the result of the competitive spirit aroused in employes as the result of the competition.

Why the Association Should Have an Accident Prevention Bureau

In reply to the question, "Do you believe that accident prevention and insurance should be made a major issue in the work of the National Crushed Stone Association," 75% replied affirmatively, commenting somewhat as follows: "National Crushed Stone Association can put this across with quarry producers better than can the National Safety Council;" "Believe that N. C. S. A. at next convention should adopt vigorous policy as to accident prevention;" "Believe that N. C. S. A. should take hold of this issue and put it over in same thorough manner in which other Association matters have been handled."

The 25% which are accredited with replying in the negative modify their vote by such comment as follows: "Accident prevention only, omitting any reference to insurance rates;" "Not necessarily a major issue, but given an important place in the affairs of the Association."

One producer who voted "no" replied that with the Associated General Contractors, the United States Bureau of Mines, the various insurance companies, the several state bureaus, the National Safety Council and other bodies all working on accident prevention, the subject is becoming over-emphasized and should not be handled by the Association. It is safe to conclude that there is an overwhelming preponderance of opinion in the crushed stone industry favoring the Association making accident prevention one of the major issues of association affairs.

The pamphlet on "Safety Practices for Quarrying," prepared jointly by the Quarry Section of the National Safety Council and the Committee on Welfare and Safety of the National Crushed Stone Association, has been of benefit to 75% of those replying to the questionnaire; 10% stated they had received no benefit and 15% replied that they had not received a copy. There is a correlation of thought between the 15% of the crushed stone industry not receiving a copy of this pamphlet and the membership in the Safety Council of 17% not having been solicited. Both of these conditions should be promptly rectified.

How Quarry Safety Work Is Now Handled

The request to "Describe briefly the manner in which safety matters are handled throughout your organization" received elaborate reply, into which it is hardly feasible to enter into detail. It is apparent, however, that those plants which have an intelligently planned and orderly operating safety organization have shown the greatest decrease in both the number and severity of accidents. Far too many replied in an indifferent, hazy manner, such as, "Believe in it myself and tell all of my men to be careful," "Insist that any man who isn't careful be fired," "Keep machinery in good order and expect men to handle it properly," etc. One executive operating only one plant goes so far as to state that he meets personally once a day with all of his employes and talks caution. If this is actually done it should achieve splendid results, but I am somewhat reminded of three women who were talking together, one of whom said, "In all the fifteen years of my married life my husband has not said a single cross word to me." The second woman replied, "My, I wish I could say that." The third one said, "Well, why don't you, she did."

It was also requested that the results of such accident work as is conducted be noted as to the number of accidents, the severity of accidents, the decrease in insurance rates and the improved morale of employes. Practically all of those who give any attention whatsoever to accident prevention, whether in a hit-or-miss manner or by orderly planning, reported that the spirit and morale of the employes was improved. The decrease in the severity of accidents and the number of accidents, as well as the decrease in insurance rates is more noticeable in the case of those companies which devote the most time and effort to accident prevention. Naturally this would be expected to be true and is merely confirmation of common opinion.

Difficulties in Conducting Safety Work

As to the chief difficulties encountered in conducting successful and effective accident prevention work, 7% replied, "Lack of interest on the part of the employes," and 11%, "The difficulty of overcoming characteristic carelessness of workers." Smaller percentages stated, "Getting the men to believe that we do not want them to get hurt even though we are insured," and "The difficulty of impressing upon superintendents and foremen that accidents are costly." In the case of 9% the chief difficulty was the failure to secure proper co-operation from employes. This is a frank admission, but I am inclined to feel that the responsibility is the employer's rather than the employe's. Several replied that negro labor is indifferent to such efforts in their behalf, as compensation for ten days for small cuts or bruises is extremely attractive. Those who have had experience in employing negro labor will recognize the truth of this observation.

Though it would seem that the answer to the last question of the questionnaire should be obvious, namely, "Do you conduct your accident prevention work from humanitarian motives or in order to reduce insurance rates, or both?" 18% replied, "From humanitarian motives only," the remaining 82% stating that both were considerations. As a matter of fact, a third reason could have been included in this question, namely, "Or for the purpose of increasing plant production?" This was not done because of my belief that the acceptance of the quarrying industry in general of the value of accident prevention work is not sufficiently advanced to readily understand and interpret such a suggested reason. It is highly probable that we do not place sufficient emphasis upon the fact that a safe plant is an efficient plant and that maximum production cannot be obtained without reducing preventable accidents to a minimum.

In reducing the number of preventable accidents, as in any other human activity, orderly planned, intelligent effort results in greater accomplishment than loose, slipshod, hit-or-miss methods. It is far from adequate for the manager or chief executive to earnestly desire to reduce accidents with a cautionary word or two every now and again to the employes as to being careful. In the crushed stone industry we have but to compare the latter type of effort to that of those plants in which accident prevention is a highly organized activity to realize the value that lies therein. Those members of the National Crushed Stone Association entered in 1925 and 1926 in the National Safety Competition have shown a marked improvement in the latter year over the former. In 1926 the accident rate of those plants entered in the competition was 6.7 days lost per thousand man hours of exposure as against 6.0 in 1926, and an accident frequency rate per million man hours of 61 in 1925 as against 41 in 1926. This indicates an improvement of 10% in the accident severity rate and 33% in the accident frequency rate. These figures relate to 38 quarries in 1925 and 37 in 1926 and are furnished through the courtesy of Mr. Adams, Supervising Statistician of the Accident Statistic Section of the Bureau of Mines. It is to be regretted that the number of quarries entered did not show marked increase in 1926 over 1925.

Improvement equally encouraging and gratifying has been made by those quarries holding membership in the National Safety Council. In fact it is largely true that practically all quarries entered in the National Safety Competition are also enrolled as

members of the National Safety Council.

Much Opportunity for Improvement

An analysis of the questionnaire submitted to the quarry industry tends to confirm another conclusion of the Committee on Safety and Production of the American Engineering Council, previously referred to —that the accident and production performance of the best plants in each industry clearly shows that tremendous improvements can be achieved by the remaining plants in each industry. As a corollary, it might be stated with equal truth that the accident and production performance of one industry should encourage other industries to achieve similarly successful results

The experience of the Portland Cement Association in the reduction of accidents is inspiringly encouraging. In June of this year 164 cement plants employing 45,000 workers participated in a no-accident drive. It is almost amazing to know that accidents dropped 75% during this month as compared with June of a year ago. During the June drive of this year 50 lost time accidents occurred as against 192 during the same period last year. Only one man lost his life in June of this year as compared with six in June of 1926. To endeavor to explain such a marked improvement in corresponding months of two succeeding years as a mere coincidence is futile and absurd. Such improvement can only be attributed to the intensive drive of the Cement Association to reduce accidents.

In other industries almost equally great improvement can be shown over periods of intensive accident prevention work as compared to similar periods during which no such campaign was in progress. For the sake of humanity in general and a lowering of production costs, it is encouraging to realize that various industries, through their national associations, are giving increasing attention to the value of this work. The Associated General Contractors of America, alert as they are to improved methods of construction and lowering of costs, are, through their association, entering intelligently into this worthwhile field.

Some Fundamentals

In the transmutation of an unsafe plant or factory to a safe and consequently more efficient one certain fundamental principles must be followed, however much the detail of their execution be varied. First, the responsible executive must recognize the several values of accident prevention effort and conceive the intention of improving conditions. Second, his recognition of such values must be transmitted throughout the organization until every man is reached. Third, the formation of a general safety committee operating through local plant committees. Fourth, the education of the employe, however tactfully it may be disguised or through whatever means it be accomplished. Fifth, through mechanical and engineering means the diminishing of all hazards and the total elimination of some.

The human spirit is adventurous; it seeks new experiences, new sensations, gropes its way unflinchingly into unknown territory, both mentally and physically. The progress of civilization has largely been due to those adventurous spirits who have dared unknown dangers to blaze the way that later generations may follow in safety. It is not unnatural to believe that in many instances the lack of care and caution of the workman is attributable to this willingness to face danger and a desire to more quickly and effectively serve the ends of his employer, whom he may like, respect and admire. He must be taught to discriminate between the bravery of the hero, courageous without stint for a worthy cause, and the unnecessary exposure to danger which may be easily avoided with proper care and caution, and that in exposing himself unnecessarily to plant and factory hazards he does not serve his interest nor that of his employer, but actually is jeopardizing both.

I firmly believe that the employe, if convinced that his employer's interest in seeing that he is not hurt is prompted by human kindness and good will, will respect and admire his leader all the more for that interest in him and his welfare. He is not in a position to ask that he be protected; he would feel that it was undignified and cowardly to do so, but the responsibility is on the executive none the less. I wish that everyone who has labor under his control and who feels a proper responsibility for its welfare, could carry in his mind and heart those lines of Pope, which, though written two centuries ago, seem prophetic in their application—

> Teach me to feel another's woe,
> To hide the fault I see;
> That mercy I to others show,
> That mercy show to me.

May God speed the day when this thought shall guide and govern our conduct.

Mid-West Members of National Crushed Stone Association Meet

A SPECIAL meeting to which all members of the National Crushed Stone Association—both active and associate—in the Central West were invited to attend was held in Chicago, September 28. The dinner and meeting was attended by 30 members.

The chief occasion of the meeting was to honor Otho M. Graves, of Easton, Penn., president of the association, and to listen to an outline of his progress to date toward the foundation of an association research laboratory. President Graves promised that the necessary funds would soon be realized and that he expected to see the project launched before the coming annual convention of the association at West Baden, Ind., in January.

W. R. Sanborn, Kankakee, Ill., regional vice-president of the National Crushed Stone Association, presided and acted as toastmaster. Other members of the board of directors present were L. R. Cartwright, Indianapolis, Ind.; E. J. Krause, St. Louis, Mo., and John Wunder, Minneapolis, Minn.

Federal Trade Commission Investigating Open-Price Associations

TWELVE investigations of industries, trade organizations and trade conditions are being carried on simultaneously by the Federal Trade Commission.

Four of the 12 investigations were initiated by the commission itself and they mark the first general and consistent exercise of the commission's inherent power to investigate business and industrial conditions at its own discretion. These four inquiries concern: (1) Joint stock acquisitions of the du Pont and General Motors companies and the United States Steel Corp., (2) maintenance of resale prices, (3) sale of "blue sky" securities and (4) practices in use regarding price bases.

The remaining eight of the dozen inquiries were started at the direction of congress. Reports on two of these, covering competitive conditions, prices, costs and profits in the bread and flour milling industry and in the petroleum industry, are nearly completed and soon will be submitted to the senate for consideration.

Most of the inquiries concern competitive conditions in essential industries. Specifically, five of the investigations involve costs and prices, three of them have to do with control and ownership, one with stock holdings, one with stock dividends and two with questions of violation of anti-trust laws. These investigations, excluding the four initiated by the commission and the bread and petroleum inquiries already mentioned, are listed as follows: Electric power industry, open-price associations, co-operative associations, lumber trade associations, stock dividends and cotton seed industry.

It is reported that at least two associations in the rock products industries are being "investigated" again.

France Stone Co. Buys Quarry

THE France Stone Co., Toledo, Ohio, has recently purchased the Consumers Lime Co. quarry and lime kilns at Tiffin, Ohio, from John Herzog of Patterson, Ohio. At the same time the France company obtained from Logan Miller the 17½-acre tract and all the equipment of the Tiffin Lime and Stone Co. which was controlled by Miller. This tract is adjacent to the Consumers company quarry. By these acquisitions N. R. France, president of the France company, controls all the stone quarries of any consequence in Seneca county, Ohio, with the exception of the Dolomite and Kennedy plants at Bettsville.

Quarry Section Meeting of the National Safety Council

D. C. Souder, France Stone Co., Elected Chairman; J. R. Boyd, National Crushed Stone Association, Secretary

THE Quarry Section of the National Safety Council held a most interesting session in Chicago, September 28, in connection with the annual convention of the Council and the annual Safety Congress. L. R. Cartwright, vice-president, Mid-West Crushed Stone Co., Indianapolis, Ind., presided as chairman of the section.

The opening address of Otho M. Graves, president of the National Crushed Stone Association, is printed elsewhere in this issue complete. There was considerable discussion of this paper, which ended in a motion put by A. C. Hewitt, of the American Lime and Stone Co., Bellefonte, Pa., that every member of the National Crushed Stone Association be actively solicited to join the National Safety Council. At present every single member company of the Portland Cement Association is also a member of the National Safety Council.

Election of Officers

D. C. Souder, director of insurance and safety of the France Stone Co., Toledo, Ohio, was elected chairman of the Quarry Section for the ensuing year. R. E. Colville, assistant manager, plant service division, U. S. Gypsum Co., Chicago, Ill., was elected vice-chairman. J. R. Boyd, secretary of the National Crushed Stone Association, Washington, D. C., was elected secretary.

About 50 operators of quarries in the commercial crushed stone industry, portland cement, lime and dimension stone industries attended the meeting.

The Human Element

Dr. E. M. Parlett, supervisor of health and safety, Pittsburgh Limestone Co., New Castle, Penn., spoke on "The Study of the Human Element in Its Relationship to Organized Accident Prevention." Extracts from his address follow:

Normal health infers physical well being, reason, sanity, judgment, energy, aptitude, clear thinking or vision, resourcefulness, self control, repressions, a willful desire to serve and advance, individually and collectively. Upon these characteristics, which are those of the higher type human, as Herbert Spencer has well said, rests the foundation upon which reposes the happiness, the power, the progress and the wealth of the country. Therefore, it may with satisfying truth be said that while a normal and healthy individual will not only in emergency and instinctively protect himself from physical violence, he goes a step further in the desire to think, to study, to co-operate with fellow humans in developing scientific ways and means of abolishing accidents by and through the prevention of both the direct and remote causes thereof. Further, it is not only the duty but the desire of the normal or highest type human to shield and protect the individual who may through the congenital forces of nature or otherwise fall into that classification of inferior grade, be it subnormal or abnormal, and may I say that ample evidence is at hand that the normal human being is fulfilling that duty of shielding and protecting the less fortunate, as witness the ennobling ideals and efforts of the membership of this splendid and inspiring organizations.

* * * *

Health promotion and accident prevention are therefore akin and equally appealing as subject to scientific investigation, study and formula, and amenable to scientific methods of approach and application. For example, science has not only been the means of discovering weak metallic structures, as well as weak tissues, by means of the X-ray, the prevention of death from shock to the body tissues of the electric current, the avoidance of acute and permanent physical harm from dusts, fumes and gases, the prevention of infections from contaminated lubricants, polluted drinking water, metallic poisoning from lead, copper, zinc, etc., the avoidance of contact or communicable disease, and of solving the problems of ventilation, industrial cancer, anthrax, stone cutter's and other respiratory diseases of industry, but science is solving the problems of human behavior, covering a multitude of human mental traits, deficiencies, perversions, aberrations, etc., to which the industrial employe may be subject, even to an appreciable degree.

* * * *

To make myself clear: Conduct is defined as the way a person acts or lives; the idea of personal and moral responsibility is inherent in the term; an energy phenomenon. When an accident occurs involving injury to the industrial employe, the first question usually to be asked and determined is, "What was the cause thereof?" "Who was at fault?" The usual answer is one of the following: "Employe neglected instructions." "Machine guard not replaced." "Employe was not wearing goggles." "Disobeyed orders." "Absent minded." "Took a chance." "Became confused." "Failed to give correct signal." "Defective tools, chain, cable, etc." ad infinitum—a long and interesting, if sordid, list of the failure of the human element, of insufficient or sustained mental endowment to anticipate, to organize, to plan and think ahead, to safeguard, to instruct and supervise, to systematize effort both personal and collective for self protection from external violence. That we are curbing accident directly or remotely charged to human trait characteristics, the sudden failure of the human element, human deficiency causes, thanks to you industrial scientists, is to be freely confessed, but that we have only just prefaced the undertaking is evident.

Work of Safety and Health Director

With the established facts in mind, how are we to proceed to the best advantage of industrial prosperity and social welfare after we have first appointed a safety and health director, put our plant in good housekeeping order and safeguarded our operations to the limit of our experience and ability, instigated and promoted by a wise, a benevolent and a co-operative management?

(a) We should by careful physical examination eliminate the flagrantly vicious in mental and physical attainments.

(b) As thoroughly instruct the new employe, as well as the old employe, in specific detail as to the hazards of individual occupation and plant operation, and to broaden the field of education as time and opportunity warrant from apprentice courses to advanced instruction in craftsmanship.

(c) Organize the man and the mass into complete units for systematic and automatic functioning. Organization means systematic concerted unit effort; a marshalling of forces for efficient orderly mass action; the management first, the direct supervising forces next in line and the subdivisions of the army of employes in the order of sequence. If you wish to accomplish certain definite objects you must proceed in a certain definite and orderly way.

(d) Supervise thoroughly and continuously.

(e) Originate and utilize every means or avenue of research possible.

(f) Make practical application of known psychological laws bearing upon human traits, human emotions, human perceptions and reactions, human limitations of intelligence, interest, sustained forces of attention and memory, human physical frailties, characteristics of race, sex and age of individual and mass temperament, as the character of toil may dictate.

(g) Promote the best working environment possible and eliminate fatigue wherever possible, keeping abreast of advanced thought relative to air conditons, light, rest periods for monotonous toil, the evils of prolonged constrained attitudes, etc., thus promoting the sustained health and indirectly the safety of the worker.

(h) Discipline when necessary. Some adults are like children in their attitude and response to discipline, involving as it does the element of fear as a guiding factor in their conduct.

(i) Promote good will, thrift, respect, cooperation, personal initiative of the worker at every opportunity by personal contact, fair play, patient instruction and friendly advice and assistance and by some welfare activities from school courses and insurance features to first aid and nursing facilities.

(j) Minimize labor turnover and seasonal occupation by all legitimate means and as economic conditions permit.

(k) The writer feels that the plant safety organization should be complete from the water boy to the president, and that each

should play an active and specific part. The psychological factor of such method firstly gives prominence to the self esteem of the lowliest individual in the plant, and secondly awakens his desire to co-operate with his fellow employes and means that he will become interested to a greater degree than he would be otherwise, even though such a person makes report daily only concerning the safe condition of his tools or his work surroundings. Committee organization is paramount, and most efficient the farther down the line it operates. This does not necessarily imply that formal meetings among groups of men under each or even any of the sectional foremen, but each employe nevertheless knows that he has a daily safety report to make and that his foreman represents him as a member of permanent division of the plant safety committee. Meetings when held, be they daily, weekly or monthly, should be routinely systematized, reporting unsafe conditons and practices, should be made easy, free of embarrassment and exact, for the individual key men by furnishing them with safety booklets in which to write their findings and recommendations in advance, and by such procedure to thus keep the meeting alive and to make it possible to conduct the business in hand with snap and order, even to those discussions that follow specific recommendations. Here is where contacts are made, friendships develop, co-operation inspired, thinking stimulated, reasoning promoted. One soon learns that "He that cannot reason is ignorant; he that will not reason is a bigot; he that dares not reason is a slave," that no pursuit is so important as the pursuit of facts, especially those impressive and established facts of safe and economical plant operation.

Safety Organization

Membership of the plant safety committee is composed of two groups, the permanent and the temporary committeemen. The permanent members are foremen, the temporary committeemen are appointed quarterly from among the rank and file of employes, each operating department being represented the representation being approximately one committeeman to every ten employes. One of the first and outstanding facts that these committeemen learn is that the management both by word and action is thoroughly and sincerely supporting safety, first for humane reasons and secondly as a necessary part of production. That is important and far reaching. When recommendations are made by committeemen or men from the ranks they are given intelligent consideration, and when original or exceptional recommendations from the standpoint of value to the greatest number of employes involved are submitted and accepted, money prizes and bronze watch fobs suitably engraved and emblematic of quarry and mine activity are presented to such employes. This is also important and far reaching.

We have organized Blaster's Schools—which meet once each month and conduct their meeting in an orderly manner similar to those of the plant safety committe. We have recently organized Trainmen's Schools, which will hold regular meetings covering train operation, train signals and safety. We have organized Five Year No Accident Clubs and Ten Year No Accident Clubs at the respective operating plants, each member of which is distinguished with an appropriate and attractive button.

We have special foremen's meetings at which every effort is made to impress upon them the value of special qualifications in their relationship to their subordinates, such as leadership, alert supervision, initiative, diplomacy, sympathy and understanding, good judgment and example by respect. Every foreman has his goggles in full view at all times, not only as an example to his subordinates but ready for instant use when the occasion arises.

Naturally we endeavor to take advantage of all advanced safety thoughts, devices and methods from the psychological realm to the machine guard and operating processes that we may utilize with advantage and without too much repetition or over indulgence. It is not unusual to surfeit to the extent even of narcotizing the employe or nullifying safety effort by too much propaganda, remembering that although you may not have given the applicant more than a cursory intelligence test upon employment, and although he may not be definitely rated a moron, that nevertheless his powers of successful mental digestion are limited.

Making Safety Interesting

However, we look with favor upon such modes of safety approach and application as: Safety rallies, picture shows are carrying safety propaganda, extensive bulletin board service, envelope slips pertaining to such matters as safety at work and in the home and upon highway, health, sanitation and personal hygiene, addreses at intervals by the local plant surgeon, attorneys, men from the ranks and officials, plant picnics, competitive contests between work sections, departments and plants, the awarding of trophies and pennants to such groups, and individual prizes as above mentioned, publication of plant accident rating as compared with other similar plants, posting the accident records of respective plant foremen, subdividing the safety committee into subcommittees and exacting a written report monthly of inspections made of chains, cables, ladders, machines, shafts, set screws, air compressors, explosive magazines, tools, falling objects, including quarry face and mine roof, fire equipment, holding routine fire drills, checking plants and specifications for safety, monthly written reports by foremen describing conditions of their respective departments with specific regard to the safety features thereof, etc.

Every accident no matter how minor in nature is reported and treated immediately. We do have infections now and then, but few indeed. Some of these I earnestly believe are the result of injuries, later claimed to have occurred on the job. To put an end to this type accident, and as a measure of protection to the company against fraud, we are arranging to have each employe at the end of the day's work mark opposite his name whether or not he has received an injury during the working hours.

A paper by Areli Jones, superintendent, Hoosier and Joyner Mill, Indiana Limestone Co., on "Safe Handling of Rock," dealt largely with safety precautions in the dimension stone industry.

Competition of Foreign Building Materials on East Coast

NEW sidelights were cast upon the financial effect the use of foreign-made building materials has upon American prosperity, through an analysis made by an official of the International Cement Corporation, writes Allen E. Beals in the current *Dow Service Daily Building Reports.*

Ever since the Lockwood investigation attempts have been made to introduce European-made materials into building markets along the entire Atlantic seaboard.

The volume of this foreign-made building material now used in general building construction has become great enough in some industries to threaten our prosperity.

In large cities like Boston, New Haven, Bridgeport, New York, Philadelphia, Baltimore, New Orleans, Miami and Jacksonville, the competition between American-made products and those imported from Europe has had a great deal to do with reducing the price of domestic material to builders and contractors. There is a limit under American standards of compensating labor, beyond which price cuts are dangerous.

Some idea of the extent of this building material price reduction can be obtained when reference is made to Bradstreet's building material index figure, which is given as 0.1278 as of September 1, 1927, as compared with 0.1283 a month ago, 0.1322 of September 1, 1926, and 0.2370 in 1920.

It is very apparent that such a marked reduction in the price of basic building materials could not have been brought about solely as the result of competition with similar materials manufactured in this country, because American manufacturing costs have remained practically where they were at the time American-made materials were selling at their highest price—namely, because demand was in excess of prompt supply. American wages have gone up, not down.

At Harvard University a new chemistry building was in the course of construction, the completion of which required 15,000 bbl. of cement. In the hope of saving at the time of purchase 14c per barrel, or $2100, cement manufactured in Belgium was used instead of American-made cement. The effect upon American industrial prosperity of substituting foreign-made building materials for those of American manufacture, on even an order of this size, is as follows:

This quantity of cement is a five-day output of a 1,000,000 bbl. per annum American Portland cement factory, representing an investment and working capital of $3,000,000.

Using a 30-day month and a monthly mill, office and field payroll of $40,000, the loss to the American worker is		$ 6,666.66
Transportation to New England carriers from Hudson River plants, 15,000 bbl. at 58c	$ 8,700	
From Lehigh Valley plants, 15,000 bbl. at 72c	10,800	
Carriers' average loss		9,750.00
60,000 cotton sacks involved, four to each barrel, average five trips per bag, 12,000 at 10c each—Loss to cotton grower and bag manufacturer		1,200.00
Considering use of 140 lb. coal per barrel, 1050 tons at $1.50 mine—Loss to coal producer		1,575.00
Transportation coal mines to Hudson River plants, 1050 tons at $3.42 per ton—Loss to carriers		3,591.00
Power—15 kw.h. per barrel at 1c per kw.h., 15,000 bbl. at 15c—Loss to power company		2,250.00
Total		$25,032.66

None of the foregoing items includes depreciation, depletion, reserve, repairs or financial expense.

Cement Mill Section Meeting of the National Safety Council

MEETING as a part of the National Safety Council held at the Stevens Hotel in Chicago, September 26-30, the Cement Section discussed the points of accident prevention peculiar to the cement industry. The sessions for this section were held on September 27, and R. Frame, insurance manager, Alpha Portland Cement Co., was in charge as chairman of the section.

J. B. JOHN, president of the Sandusky Cement Co., Cleveland, Ohio, gave an address on the responsibility of the plant executives for the safety of their men. Mr. John briefly gave the history of accident prevention work in the cement industry from the time of its inception when it was an unusual thing for a plant to run eight or ten consecutive days without a lost time accident, through the period four years later when the first plant had a perfect record for a whole year, and up to the present day when 23 plants have maintained a perfect record from the first of the year to date. The speaker then outlined the difficulties which the early safety workers encountered when superintendents were indifferent and often antagonistic. The conditions have been changed since that time so that executives now are generally glad to co-operate with the safety men. He urged that both safety workers and general executives have the welfare of the employes at heart in order to accomplish their purpose.

Report of the Secretary

A. J. R. CURTIS, assistant to the general manager, Portland Cement Association, presented the secretary's report. He reported that there were 79 companies of the Portland Cement Association who were members of the National Safety Council. During 1926 there were approximately 400 less lost time accidents for the member companies than in 1925. For the same years the fatal accidents decreased from 61 to 45. Mr. Curtis referred to the safety pledge cards exhibited in the meeting room as evidence that the worker was becoming more and more interested in the safety movement.

Mr. Curtis also mentioned the interest which the public press has taken in the cement association's campaign for the prevention of accidents, citing the fact that more notice was given to this phase of the cement industry's work than to any other feature of the industry, not excepting the promotional work which the association carries on. The secretary spoke of the fine record of the Lehigh Portland Cement Co., which had a record of not a single lost time accident in June at any of its 17 mills. Although it is hard for large plants employing many men to maintain a perfect record, the work of the Lehigh company was cited as an example of what could be done.

Mr. Curtis stated that there were twice as many lost time accidents in July of this year as in June, a record of which no one can be proud. The cause obviously was the let-down of watchfulness following the intensive June campaign. Even though the July accidents totaled only 50% of the number for July, 1926, the example of the let-down from June serves to show just what would happen if the safety work of the association were stopped entirely. That the association is not letting down is shown by the record of 400 less accidents and 8 less fatalities to date this year than occurred to the same date last year. The foundation work of the whole program, Mr. Curtis said, is the fine reporting done by the member companies. Where follow-up letters are not necessary, more work can be put on the future program. The competition for the trophies has been the biggest incentive toward safety in mills that the association has devised.

Concerning the work of the individual plants, Mr. Curtis said that generally the same plants that stood high on the list in 1926 were the ones that were in the "Trophy Club," or no-accident group, this year. However, the scheme frequently appeals only to the plants which have a chance to win a trophy, and the plants that are hopelessly out of it do not try. The latter total about 25% of the membership, and it was urged that it was necessary to find some means to reach this group.

The dedications of the trophies presented for 1926 to the Lehigh plant at Mitchell, Ind., and the Canada Cement Co.'s mill, near Winnipeg, Manitoba, gave the companies opportunity to create considerable good will toward the plants in the surrounding territory, by means of the interesting and educational features of the meetings. It was urged that dedications in the future always take on this aspect.

The district safety meetings held at various cities throughout the United States were reported to be a great source of benefit in the accident prevention work. In closing, Mr. Curtis urged the necessity of getting the 1928 campaign started at once in order that it would be actively working before the first of December, so the men would be in the habit by January 1, 1928.

Interesting Workmen in Their Own Safety

W. P. SABIN, assistant to the president, Ash Grove Lime and Portland Cement Co., Kansas City, spoke on "How to Interest Workmen in Their Own Safety." He brought out in his discourse that legislative methods cannot be effective and that only by personal contact with the employes can a real safety program be put across. An appeal to the sporting instinct of the men has been used successfully at the Ash Grove company's plant, the employes being divided into four groups which compete against each other for the best safety record. A bulletin board on which employes persisting in dangerous practices are held up to ridicule, has been installed. The plant uses a secret service system among the men for gathering its safety material and has found the method very effective.

Physical examinations have been required of all employes, and the examinations are repeated at periods usually a year apart. As a result of these examinations men who are found to be unfitted for hazardous work are transferred to less hazardous work.

During the discussion that followed Mr. Sabin's talk the question of reaching foreign speaking employes was brought up. Two opinions were held—one, that the material should be translated into his own language, and the other that all the work should be delivered in English and translated, if necessary, by the employe's children who are generally sufficiently advanced in school to understand the material. It was also stated that foreign employes frequently understand pictures, flags and similar easily understood signs, when they could not understand material even in their own language.

Election of Officers

At the afternoon session the following officers were elected:

Chairman, T. F. Halpin, special representative, Marquette Cement Manufacturing Co., Chicago.

Vice Chairman, F. E. Town, superintendent, Manitowoc Portland Cement Co., Manitowoc, Wis.

Secretary, A. J. R. Curtis, Assistant to the general manager, Portland Cement Association, Chicago.

Fixing Accident Responsibility

The paper by W. L. White, superintendent, Sandusky Cement Co., Cleveland, Ohio, covered a most vital subject in all successful accident prevention organization and work—"Fixing Accident Responsibility." Extracts from his paper follow:

Fixing accident responsibility is a most serious problem. It calls for a decision, which, under any circumstances, is hard to make; one which must be carefully studied,

and only a cool, clear, unbiased opinion is to be used in handing it down.

* * * *

There are four headings into which "Fixing Accident Responsibility" can be classified:

(1) Executive or company policy
(2) Plant manager or superintendent
(3) Plant Safety Committee
(4) The individual

(1) It is a well-known fact that the attitude of the superior officer or executive, president or board manager, or whatever individual or group directs the policies of an oganization, is reflected down to the humblest employe. If this individual, or group of individuals, is not squarely behind the welfare of the employes, and does not sanction safety work, it has a bearing on results secured by the company. This might be termed more psychological than actual, and, therefore, a president could hardly be accused of being the cause of an accident. However, careful analysis shows that he is responsible to a much greater degree than a casual glance first discloses. The mere fact that most individuals and groups look up to leaders for initiative is sufficient cause for the statement that the executive is responsible in a certain measure, for accidents if he, or they, are indifferent to the safety movement.

It is inconceivable that an executive of today is not squarely and actively behind the safety movement. There are some who are passive, though, and such should certainly be held liable for at least part of the responsibility of the accidents occurring in their organizations.

(2) The second party on whom the responsibility of accidents rests, is the plant manager, or superintendent. In a great measure, the entire success of safety work depends on him. If safety is not being pushed energetically, or, as in some few cases, is not even considered, then this man is directly responsible, except, perhaps, in the rare case where his good intentions are held in abeyance through the orders or wishes of his superiors. A good plant manager includes the safety movement as part of his daily duty. I say daily because safety work is largely missionary work, and the true safety man can be likened to a missionary who toils unceasingly, day after day, without any thought of reward, gratified entirely, through love of his work, with but small visible results. He must be a keen student of human nature. His interest must never lag. He must be able to put across the idea of safety, not only to the safety committee, which should be directly under his supervision, but also able to put the idea across to the individual, through his actions and speech.

* * * *

(3) It is no easy task to have a safety committee function properly. In the early beginning, when safety committees were first organized, while it was not the rule, yet a good many plants had a safety committee in name only. This committee might be composed of any number of men, meetings would be called at various irregular intervals. Sometimes the members of the committee were "too busy," having a small repair job to work on, and considered the operation of the mill of more importance than the safety committee meeting. Again, the spirit of the organization would be dominated by the plant executive because he took it upon himself to turn down all recommendations except those which he himself might bring before the committee, feeling that an employe was "treading on his toes," or presuming beyond his station, or overstepping his authority. In other words, the safety committee was not being handled right by the plant executive. A good executive will have a good safety committee, and this is the third group upon which the responsibility for accidents rests. It is not right for a superintendent to take upon himself the duties of a safety committee, so to speak, nor to inspect the plant at such times as he may see fit, perhaps with one member of the safety committee or alone, nor to install certain safety devices and consider good safety work being done. Such practice, in reality, is nothing but the result of egotism on the part of the superintendent.

T. F. Halpin

A manufacturing plant as large as the average cement plant today needs a safety committee that consists of not less than six, and ten is considered approximately the right number for a 3000-bbl. plant.

The committee itself must be made up of real safety men, whose enthusiasm must be ever to the front. The members of the committee should not necessarily be chosen by the superintendent, as the employes know best who of their number is most interested in safety work.

The committee should meet at regular intervals, and, in addition, have special meetings when the occasion demands, such as a serious accident, and it is only right to place in its hands the fixing of accident responsibility.

A man does not have to be college bred to make a good safety man, but he should be one of sound sense, a thinker, and have a good understanding of the idiosyncrasies of human nature, coupled with unflagging interest and endless patience. When all of these characteristics are found in one man, he is a jewel well worth keeping and generally demonstrates his worth through the results obtained. However, it is not difficult to find many of these characterisics in the average plant employe. If the safety committee is properly organized, and has the shining example of a good superintendent, it is bound to function efficiently.

It will not do to appoint a safety committee and then, on the day or days specified for the regular meetings, permit its members not to attend on account of some breakdown in the mill, or other excuse which might be forthcoming; or, on the other hand, to cancel the meeting until the next day, or the day after, as the superinendent may have something which he considers needs his attention. There should be, as stated before, a specified time for the meetings and the schedule should be adhered to, and, except for unforseen, serious reasons, no member should be allowed to be absent. If there are one or two members who would rather not attend, it is usually an indication of lack of interest, and they should be removed without further consideration, and others appointed in their places.

Neither should be the plant superintendent, through the authority vested in him, become a jury of one and veto valuable suggestions offered by various members of the committee, merely because they might not strike him as the right move. If the suggestion is approved by a majority vote of the committee, unless he questions it at the time it is discussed and gives reasons sufficient to vote it down, the resolution should be placed on the books and the work done as suggested. Too often a peremptory veto takes the pep or enthusiasm away from the committee, and this, in turn, is reflected throughout the organization. With what result? Either there is an increase in accidents or a failure to obtain results in periods when drives are put on, such as the recent campaign of the cement industry in June of this year. Accidents in plants can be reduced if the safety committee is functioning properly, under a good executive. If they are not reduced after the organization is started, then it must assume its share of blame for all accidents, major or minor, which occur, for it has failed to do its duty, which is, first, putting across the safety idea to fellow employes, and, second, providing the good example.

* * * *

(4) Fourth and last comes the individual himself. Except in catastrophies, where many are injured, and some killed, it is the individual who is generally responsible for the accident, and that responsibility must rest on his shoulders. Only, however, after a thorough investigation. If the plant superintendent is a safety man, and his safety committee is working properly, the injured employe has had an opportunity, through observation of the actions of his fellow workers, and discussion with them, to learn about the safety movement and has been instructed regarding all hazards about the plant. If he does not benefit through these methods he is entirely to blame.

* * * *

These comprise the four headings into which responsibility for accidents can be classified, but they are only one side of the subject. There is another side, which some people have emphasized, that is, the sentimental. It is not the intention to take that up in this paper, as sentiment should not be used in handling safety matters. The only sentiment which enters into the situation is this: the man, or men who are responsible for an accident, and on whom the responsibility is placed, are usually punished sufficiently through the knowledge that they are the cause of pain and monetary loss to a fellow being, and further punishment should not be meted out, except in cases of gross carelessness, other than the publishing of the fact that they were directly responsible for the accident. That is as far as sentiment should be considered in handling this matter. Nor should generosity be considered in placing the responsibility.

* * * *

If all executives have safety work at heart it would do worlds of good in reducing the number of accidents in their plants, for every individual would be proud of the fact that he was doing his little bit to have a good safety record, and one of his reasons for this satisfaction is the knowledge that his superior officer is keeping a close check on the plant's accident record.

* * * *

Keeping Up a Perfect Record

W. H. WEITKNECHT, superintendent of the Lehigh Portland Cement Co. plant at Mitchell, Ind., spoke on "How a Mill With

a Perfect Record Can Keep It Up." He called attention to the two methods of obtaining safety results, namely, corrective and preventive. Corrective methods deal with placing the responsibility after the accident occurs, a very necessary but negative measure for accident prevention. On the other hand the preventive method anticipates the accident and gets rid of the bad practice before an accident can occur. In this connection, men who frequently had accidents or near accidents at the Lehigh plant were transferred to less hazardous work, and if they still were liable to accidents they were asked to quit. The keynote of the preventive program was the personal responsibility of the individual. Each man felt that he must do his share, and to keep up this spirit, contests for accident prevention were introduced. Regular safety meetings helped to keep the enthusiasm alive, Mr. Weitknecht declared, and the regional safety meetings of the Portland Cement Association were a great aid in keeping the spirit high.

In the discussion that followed Mr. Weitknecht's talk a number of points of interest were brought out. It was shown that of the plants represented at the meeting 12 employed a full-time safety man for the one plant. Several safety measures were discussed, namely that respirators are generally not beneficial and frequently are an accident hazard, and secondly that screw conveyors are always a source of danger and covers or grates should always be bolted down in such manner that it would take any employe considerable time to remove the grates. Mr. Quigley of the Department of Safety, state of Pennsylvania, called attention to the work that state is doing in getting men who have actual experience in the cement industry, for example, to inspect cement plants and talk over the accident problems of the plant. Mr. Quigley stated that statistics of his department showed that 75% of all accidents could not have been prevented by safeguards on machinery but could only have been prevented by education of the workers.

Cement Section Dinner

Following the two sessions during the day, a dinner for the delegates to the Cement Section was given at the convention hotel. Walter G. King, the president of the National Safety Council, acted as toastmaster. The address of the evening was delivered by Isiah Hale, safety superintendent for the Santa Fe railroad. The keynote of Mr. Hale's talk was that the best means of promoting safety in the plant is by building up the morale among the employes. He said that he hoped some day to deliver a safety talk in which he would not mention safety once, depending only on his appeal to the men to accept increased responsibilities in their jobs to obtain the safety results desired. Declaring that the employe's attitude toward his job is the most neglected asset we have, he urged that executives learn how to utilize this asset.

The campaign for a better morale, of which the safety program is an integral part, according to Mr. Hale, is essentially made up of two major features. These are the responsibility of the executive to his men, and the responsibility of the employes to their jobs. Mr. Hale pointed out that safety principles will not boil up from the bottom, but must percolate down from the top, and every executive, from the president of the company down to the newest foreman, must realize this principle and accept the responsibility of giving the men better and safer working conditions. But more than that, the executives must teach the men their own responsibility to the job, because most employes have no idea of any such responsibility. The men should be taught that their job is the best friend they have, and that it should accordingly be guarded zealously. And when a man of his own accord works to build up the morale of the company he has at the same time promoted the accident prevention program. Mr. Hale commented on this by saying that "all men are born equal, but it is their own fault if they remain so," and also "men who try to do something and fail are better than men who try to do nothing and succeed." Obtain the enthusiasm of the men, Mr. Hale said in concluding his address, and the biggest step has been made toward increased production, better working conditions and safety. But to obtain this enthusiasm there must be co-operation between the executive who lead and the worker who follows.

Use of Cement Increasing in Netherlands

THE use of cement for building purposes and for public works, excluding roads, is steadily increasing in Netherlands. Domestic production is insignificant, though a new mill of moderate capacity is now in course of erection in the Province of Limburg.

Imports have risen from 476,766 metric tons in 1923 to 709,146 tons in 1926. For the first half of 1927 the figure recorded is 357,547 metric tons compared with 317,284 tons for the corresponding period last year.

Whereas Belgium supplied 49% in 1926 compared with 45% from Germany, the positions were reversed in the first half of 1927, Germany supplying 51% against 47% from Belgium.

At equal prices Dutch contractors and builders prefer the German quality, a brand made in Heidelberg having the greatest preference, followed by one made in Illigen. There is only a small demand for quick hardening cement, which is chiefly supplied by Norway.

Although Belgium is a cheaper producer than Germany, the latter is prepared to meet the competition, not only to maintain but to strengthen its position in the market.

Prices quoted in Netherlands for German cement are greatly below prices quoted in Germany. On a recent contract the Germans outbid the Belgians on an 800-ton lot for delivery in bags of 50 kilos to The Hague at 13 guilders per metric ton of 1000 kilos. On a contract for delivery of 200 tons at Veendam in Netherlands' most northern province the price paid was 15.50 guilders. Prices depend to a great extent on whether the job is favorably situated for direct discharge from Rhine barges. General quotations for Belgian cement range from 13 to 14.50 guilders, depending on destination.—*U. S. Commerce Reports.*

Kosmos Portland Celebrates Improved Accident Record

LABOR DAY took on an added aspect at the Kosmos Portland Cement Co., Louisville, Ky., the employes of the company celebrating in appropriate manner the greatly improved accident record of the past year. The workers and their families assembled for a picnic on the company's picnic grounds on the bank of the Ohio river. The program of events was in charge of A. C. Brown, vice-president and plant manager of the Kosmos company.

Employes and families, Kosmos Portland Cement Co., gathered at the picnic grounds

Editorial Comment

An Open Letter to the Lime Industry

Isn't It About Time to Face Real Issues With a Broad Mind?

SINCE the action of the National Lime Association at the White Sulphur convention in May, 1927, we have listened to, and read, many comments, both within and without the lime industry. We have been urged to do this or that, or the other thing.

We feel ourselves an integral part of the lime industry, yet we are not producers. We share the confidences of many producers and also of many users, yet our sympathies are with the producers. We have promised ourselves, and those most vitally concerned, to offer no criticisms that were not constructive. There has been a sufficiency of the other kind.

The little editorial note in our issue of September 17 "God Save the Lime Industry" may have led some readers to think we too had added our little hammer to the general knocking campaign. Far from it. It was a thoroughly premeditated opening to what we are convinced is a constructive suggestion toward the solution of the present problems of the lime industry.

The lime industry in this country dates back to days when Americans were required to preface or close all important promulgations with "God Save the King;" which was one way of saying "God continue and preserve the ancient and honorable institution of royalty—or the State." Since those days we have ceased to say "God Save the King," but have exercised our wits and energies to develop and expand "the state" to meet our aims and greater outlook, rather than to implore the Almighty to continue "an ancient and honorable institution" merely because it was ancient and honorable. That's why we are Americans and proud of it.

The lime industry seems to us very much like the institution of royalty. First, because we have never heard the subject of lime formally introduced without great stress being laid on its antiquity and honorable character; second, because there seems to be a deep grounded sentiment to preserve the lime industry in all its antiquity and ritual; and third because it seems to have changed its character so little since the days of "God Save the King." In other words the lime industry, as a whole, seems as incongruous to modern industrial America as royalty does to our present republican government.

So, if any lime manufacturer's feelings were hurt by our attempt at a serio-comic analysis of the lime industry in the aforementioned editorial, please forgive us, for we were merely paving the way for what follows:

Much Required of Lime

No other simple, basic material is called upon to fulfill so many various and exacting requirements as lime, and yet, until comparatively recently it was attempted to meet all these various requirements with one universal lime product. The ignorance in regard to lime and its functions was colossal, even in advanced chemical industries where other details were long matters of exact knowledge.

There were many reasons for this, but undoubtedly a very important one was a lack of scientific interest in the product on the part of lime manufacturers. For within the last few years it had come to be felt and recognized by intelligent manufacturers and producers in all lines that (1) under stress of mass competition of organized industry vs. organized industry, material vs. material, the same old law of the survival of the fittest still held; (2) that to survive, let alone grow, eternal vigilance and effective promotional work were the price of success; (3) that effective sales promotional work must be intelligently done—largely educational, and founded on indisputable facts; (4) that the basis of intelligent sales promotion was the best possible knowledge of the product to be promoted that modern science can obtain—and that the producer, not the user, is the one expected to do the promotional work.

A Short Essay Into the Field of Research

A few far-sighted lime manufacturers recognized these truths long ago. Many had some appreciation of them, a few are probably still strangers to them. In any event a brief essay into the field of research to find out some fundamental facts about lime by the organized lime industry ended some six months ago rather ignominiously for the lime industry. This was not surprising in an industry comprised of many relatively small units and so firmly grounded in the belief that "lime is lime." Many executives in many industries do not yet have a real understanding of what "this new thing"—industrial research—is all about.

"Research Requires Money and Men"

Under the title above was an article in *Iron Age*, July 14, 1927. We reprint it entire:

Industrial research, its cost, its value, and its personnel, was discussed at meetings held July 6, by the Institute of Chemistry at Pennsylvania State College, State College, Penn.

Research was defined as "Scientific Experimenting to Establish and Coordinate Facts," by Dr. L. V. Redman, vice-president General Bakelite Corporation. He further characterized it as the greatest gamble in the world for an individual, but the surest thing in the world when spread over the whole nation.

"Purely scientific research may be revolutionary, may produce enormous wealth for the world, but it will not necessarily do it in two, three or five years. One can well imagine that a research eliminating tuberculosis, which kills every seventh person in the United States, would be one of the most profitable things the United States could do, but one cannot do it and establish sanitariums and have it on a paying basis in two or three years. Purely scientific work will pay a country enormously but no private concern for private gain can hope to undertake it.

"Practical research has only one type of support and that is money that is wanting and clamoring for immediate return. Pure science has no immediate time function and for that reason is probably the happier. Practical research, on the other hand, will not wait for dividends longer than three, five or at the most eight or nine years. If a longer time is demanded the courage of the one placing his money will grow less and less and the effort may fail from want of financial support.

"In casting about for financial support for doing practical research there are three sources.

"First, your own financial support, carried on for yourself (such as Goodyear did and which all too often leads to the tragic hardships he had to pass through). Some men have made good—defining 'good' as making a fortune—under these conditions. McCormick with his farm implements is one.

"The second type of support is that of assistance of private fortunes, such as Eli Whitney had in producing the cotton gin. You will recall that his classmate from Yale, Miller, had married the widow of General Greene of Revolutionary fame and by this marriage the fortune of Greene was made available for Whitney's experiments.

"The third and most common form of financing is for the research and development to be paid for by existing corporations, and this is the common method in use in America today.

"The real shamble the researcher gets into comes after his research is done. Assuming he has been successful as a researcher, he is only going into the battle that will defeat him. If his research is successful it will take ten times the amount of money it cost to develop his ideas. If then the development is successful, it will very probably take ten times that amount of money to make it commercial, so that the ten thousand dollar research needs one hundred thousand dollars for development and the one hundred thousand dollar development needs one million dollars for manufacturing.

"It is this constantly increasing demand on capital which is the Waterloo of the researchers. Not only does he require $10,000 for research, $100,000 for development and $1,000,000 for manufacturing, but if he is pressing his work through an organization, it very probably will have to write off for obsolescence some factory which has been rendered useless by the invention, and it is with considerable timidity that any board of directors approaches the question of throwing one plant into obsolescence for another."

Dr. C. E. K. Mees, director of research, Eastman Kodak Co., pointed out that such research is the thing that prevents depreciation in the intangible assets of a corporation and its cost should be carried, not as a capital charge, but as a current expense. "Research is insurance against obsolescence of industrial methods. It prevents processes from getting out of date.

"There are three types of research carried on by industrial firms. The first looks for ultimate but not immediate results. The second has to do with development of operating processes, and the third is directed to service. The first two are proper depreciation expenses. The last is a definite current expense. Long time research makes money for a concern. Research is like panning gold from a stream. One lives from the gold dust one collects but always seeks nuggets. These nuggets of research are the result of what I call long time research."

Dr. Charles H. Herty, past-president of the American Chemical Society, said that industrial research is threatened with curtailment since the demand for qualified men outstrips the ability of our universities to furnish them.

"Sixteen years ago the American business man knew little or nothing about industrial research," said Dr. Herty, "but today the need for it has been impressed upon men all over the country in all lines of business and there is a question of curtailing industrial research to fit the men available. There is a very real danger in this unless it is met by pushing forward the education of young men qualified to undertake such work. Education must broaden the understanding and deepen the grasp of young men to fit them to carry on. More must be done in the universities, and graduate departments must actively encourage men of high mentality to go further. No brakes must be placed upon research but rather every encouragement must be offered to young men to fit themselves to carry on.

"Government laboratories are not the place for industrial research, but for investigating in fundamental science from which the people of the nation may profit greatly but from which the individual will profit only incidentally."

The reader who has absorbed the foregoing knows why co-operative research work in the lime industry ended as it did. Practical results were expected by the majority of contributors too soon. Probably few manufacturers were equipped to use the results of such research work as had been done. The few who were able to use some of these research data doubtless believed themselves capable of carrying on their own research work. Perhaps they are, but to carry on fundamental research work such as the lime industry needs at this moment, will prove mighty expensive for any single producer; and eventually the entire industry will profit from it, whether the individual producer wishes it or not. Scientific truths, if they are used commercially, cannot long be protected by patent nor by secrecy. Therefore it is better that the entire industry share in the cost of the search for them.

There Must Be Recognized Standards

It must be granted that various kinds of limestones produce lime of various chemical and physical char-

acters. It must be granted that the varieties of limestone are almost as numerous as the quarries from which they come—even more numerous because every single quarry has a variety all its own. It must be granted that different shades of burning give the same kind of limestone different characters in the lime. Hence there is no gainsaying the fact that classification and standardization of lime will be beset with many difficulties. But William E. Carson, president of the Riverton Lime Co., Riverton, Va., was right when he said at the White Sulphur convention:

Not only should we promote and investigate our different lime products, but we should go further and set up a quality standard for these products, so that every person in the association, and every person who joins the association hereafter will be obliged to maintain, at all times, a high standard of quality for the lime products that he puts on the market.

We know only too well, that the lime hydrate that some manufacturers are selling should never be sold as a first class building material. I have known of instances where sweepings have been taken off the lime floors, bagged, and sent out as hydrate. Other than the A. S. T. M. standard, which is more honored in the breach than in the observance, we have no system of grading or classifying the different products in the lime industry. This is all wrong. No industry can prosper that does not police itself. We ourselves should see to it that the consumer gets only high class products.

We should have formulated some kind of standards in the association as part of the membership agreement, and every member should be forced to bring his goods up to this standard. This is the only way by which the legitimate lime business can be brought to a place where there is real money in it.

When Mr. Carson said that he probably did not know, nor so far as we can determine, did any lime manufacturer know that there was another industry which had faced and solved almost a parallel case of a complicated variety of products all commonly known by a single term. That parallel case is the experience of the malleable iron industry, and its solution is the Malleable Iron Research Institute, with headquarters at Cleveland, Ohio. At our earnest solicitation, Robert E. Belt, secretary-treasurer of this institute has described for Rock Products the essential features of its functioning as follows:

How a Trade Organization Establishes Quality Standards for the Product of Its Members

The establishment of standard grades and qualities by manufacturers within an industry is both a protection to consumers' interests and a means of insuring more economical production and distribution, and it is infinitely better when such standards of quality and uniformity are established voluntarily by the trades themselves.

The lack of established quality standards adds largely to the cost of production and distribution because of the necessity of buying or selling upon sample or individual specification, and because of the chance for fraud and misrepresentation. Business is facilitated, and the ground for commercial disputes between buyer and seller is narrowed when sales are made on the basis of standard specifications.

About ten years ago, a vision of the increasing responsibility to be met by their product in railway, automotive, farm implement, and general industrial construction, led a number of progressive members of the malleable iron industry to resort to co-operative research with the idea of standardizing the quality and uniformity of malleable castings. Through these years of consistent effort, the malleable industry has really found itself and is today a conspicuous example of what well directed associated effort can accomplish in raising the standards of an entire industry.

A brief recital of these accomplishments is of interest to those industries that are coming to realize the possibilities of doing business on a "standard of quality" basis. Although malleable iron was first made nearly two centuries ago, it is only within the last decade that its manufacturers, through co-operative research work, have been able to substitute definite, scientific processes of manufacture for hit-and-miss methods of the past.

Condition of Industry Prior to Research

Ten years ago, there was little definiteness to the physical properties of malleable iron and there were practically as many varieties as there were companies making it.

Every producer had his own theories, many of which were based on meager and insufficient knowledge of the whole subject. The annealing process by which the casting loses its brittleness and takes on the valuable properties of malleability was accredited to reasons that later have proved erroneous.

There were a few producers, even at that time, who were striving independently to improve the quality of malleable iron by scientific study and research. But whatever discoveries were made by them were jealously guarded as trade secrets and the industry as a whole did not benefit. This policy proved a boomerang to the industry in that inferior metal still being made by old rule-of-thumb processes was stigmatizing all malleable iron regardless of quality. The producers for the first time began to realize that the success of their industry depended not alone upon the quality of the product of their particular company, but upon the dependability of the product of all other producers in the same line.

This was the condition prior to 1915 before scientific research and testing of materials through co-operative effort were begun. At that time a group of about twenty-five producers (today known as the Malleable Iron Research Institute and having a membership of 60 companies) determined to enlarge their field through co-operative action and to take certain, definite steps

toward raising the standards of the industry. They decided:

1. To conduct extensive metallurgical research regardless of cost, in order to make a uniform, high grade product.

2. To disseminate this scientific knowledge among all members so that the entire group could produce a standard quality.

3. To develop new fields and markets for the product, the application for which would be broadened through a technical knowledge of its true characteristics and properties.

4. To see that every public statement regarding the product should be conservative and that it should be accompanied by accurate data to substantiate it.

At this time a research department was organized and an eminent consulting engineer was retained to carry on the research work. The veil of mysticism that had been woven about the production processes of some of the more successful companies was lifted and the best from each was adopted.

Since that time the consulting engineer has labored unceasingly to instruct members in sound plant practice and correct principles of manufacture. Through research, the institute has become an instrument of service to all industries in which malleables are used and has raised the manufacture of malleable iron from a hit-or-miss proposition to a scientific basis.

Test Bars Submitted Daily by Every Member

When the research work was started, one of the first requirements was that each member submit test bars daily to the consulting engineer for an independent determination of tensile strength, elongation and other important physical properties. This practice not only shows the quality of each member's product, but furnishes data on which a comparison can be made of the product of the whole membership.

Equally important, it also served as a direct and positive measure of the improvement in quality from month to month. This practice of requiring every member to submit test bars from daily heats, still continues and is supplemented by inspectors, acting solely under the direction of the consulting engineer who make frequent, unannounced calls upon member companies to check up the manufacturing processes, the product itself and in general to serve as a check upon the actual test of bars submitted by member companies. The test bar record thus reinforced by constant field investigation of plant methods may be considered truly representative of the product.

Constantly Setting Higher Specifications at Which Members Could Aim

At the time the research work was started, the specification of malleable iron of the American Society for Testing Materials called for a tensile strength of 38,000 lb. and 5% elongation in two inches. This specification, while exceeding the product of most of the companies, was, as later developed, far short of the possibilities of the metal when properly made.

Through individual plant inspection, the adoption of the more successful practices and the submitting of test bars regularly, it was not long until the majority of the plants were making a product that exceeded the specifications of the American Society for Testing Materials. Upon the direct solicitation of the institute, its specifications were later adopted by the Society of Automotive Engineers and other technical organizations.

Inspired by its success in constantly improving the quality of malleable iron and not content to "leave good enough alone" the institute aspired to a still higher standing for the product of its members. The result is that the present specification of 50,000 lb. per square inch tensile strength and 10% elongation was adopted and again the different societies were requested to raise their specifications. The product of member companies today averages better than 53,000 lb. tensile strength and 18% elongation. It is doubtful if there exists a similar instance of a trade organization requesting that the leading engineering societies increase the rigidity of the specifications covering the product of its members.

Since the research work was inaugurated, the strength of the product has been increased 40%, and the elongation or ductility, 250%. Other valuable prop-

The high yield point of Certified Malleable Iron makes it invaluable to the engineer designer.

Certificate Holders During Quarter Ending March 31, 1927

High Yield Point Means Useful Strength

Certified Malleable Iron illustrates the importance of considering yield point rather than ultimate strength alone when specifying material. After all, it is useful strength of material that we must consider and pay for in designing machines or parts, and this is the strength that lies below the yield point.

Yield Point 65% of Ultimate Strength

The yield point of Certified Malleable averages about 65% of its ultimate strength. Thus Certified Malleables with a minimum ultimate strength of 50,000 pounds per square inch (A.S.T.M. Specifications) regularly exceed 30,000 pounds per square inch in yield point.

Certified Malleables are uniform in structure and quality. They regularly exceed the standard minimum specifications of 50,000 pounds tensile strength and 30,000 pounds yield point, thus assuring a uniformly high degree of useful strength as indicated by the yield point.

MALLEABLE IRON RESEARCH INSTITUTE, INC.
UNION TRUST BUILDING CLEVELAND, OHIO

CERTIFIED-MALLEABLE IRON

erties such as uniformity, soundness, rust-resistance, have shown equal improvement.

The Practice of Issuing Quarterly Certificates of Merit

As an incentive to greater effort toward improving quality, the institute a few years ago instituted the practice of issuing quarterly certificates of merit. As the awarding of a certificate for a given quarter is wholly in the hands of the institute's consulting engineer, the only possible way in which one can be secured by a member is through rigid adherence to requirements in connection with physical tests and integrity of product during that period. Before a certificate can be awarded to a given plant, two general conditions must prevail:

First, the test bars from each day's production sent to the institute's laboratory must have met the specifications for tensile strength and elongation, and

Second, the plant practice of the member must receive the endorsement of the visiting inspectors.

Out of the practice of issuing certificates to members, came the idea of "Certified Malleable Iron"—the product of certificate-holding plants.

While originally intended only as a reward of merit in plant practice, the possession of a certificate has come to be a guide by which buyers determine the source of supply for their malleables.

It is interesting to note that frequently members have striven for years to get their name on the published list of "Certified Malleable" producers, even going to the expense of rebuilding their plants and revamping their equipment and foundry practice in their effort to meet the institute's requirements for "Certified Malleable Iron."

If, for any reason, the product of any member falls below the established standards, for any quarter, the name of that company is dropped from the quarterly list of certificate holders, and his name is also dropped from the list that is part of every magazine advertisement put out by the institute. Thus it can be seen that there is a real penalty imposed should a member become careless or indifferent.

For Those Who Can't Make the Grade

Immediately the question arises, what will happen to those lime manufacturers who cannot meet the required standards? Can they be expected to continue their support of the research work? Will they not become peeved and try to upset the whole scheme?

Of course, no one can say with certainty what will happen, but judging by the experience of the industry used as an illustration, these questions are not so difficult to answer. In the first place progressive lime manufacturers will use every effort to make lime that can be "certified." They will have every assistance that the laboratory and staff of the Association can give them. They will have the benefit of much current literature on the subject, and much that has gone before. Some will contend that their particular markets do not require "certified" lime; and in this they will doubtless be correct; in the meantime they can profit much by raising the tone of the lime industry by supporting the laboratory.

Mark Time or Progress?

It is not our intention to picture the lime industry as at the point of disintegration. Lime is too essential a commodity to ever be displaced in many fields. It can go on as at present indefinitely. But we do believe that some such plan as that presented in our illustration is the *only* method by which the lime industry can progress at a pace commensurate with other industries faced with similar or even identical problems.

Fineness of Slaked Chemical Quicklime

A DETERMINATION of the fineness of slaked chemical quicklimes has been undertaken by the U. S. Bureau of Standards. The data obtained will form the basis of specifications covering lime for use in chemical industries. Many of these industries find it advantageous to use quicklimes in order to utilize the heat of hydration. This principle is used, for example, in the liberation of ammonia from the ammoniacal liquors produced in the by-product coke industry. In those industries in which quicklime is used as a reagent, it is desirable that the distintegration of the quicklime during the process of hydration should be as complete as possible. A fine state of subdivision increases the rate of solubility and the speed of reaction. Coarse material not only decreases the solubility and efficiency of the lime, but also has a deleterious effect on processing machinery.

In the method which the bureau is following in its fineness determinations a 100-gram sample of quicklime is added to an excess of water. The lime-water mixture is agitated frequently during the first hour. During the next 23 hours the mixture is stirred six times. The stirring is carried on cautiously to prevent the mechanical disintegration of the large particles which naturally occur. Of the samples of quicklime only one was of dolomitic origin, in which case precautions were taken against drowning. The mixture was then poured through a series of standard sieves nested as follows: Nos. 30, 50, 100, and 200. The determination of the amount of material retained on the sieves, as washed through by using a moderate stream of water from a ¼-in. rubber tube, followed substantially the practice recommended by the American Society for Testing Materials for determining the fineness of mason's hydrated lime. The washing was continued until the water passing through the sieves was clear. In no case was it found necessary to continue the washing for over 10 minutes. The sieves were placed in an electrically heated drying oven for one hour and the contents on each sieve finally weighed.

The following results give the progress of this investigation to date:

Through Sieve No.	Retained on Sieve No.	Sample No. 11	21	24	28	35
.....	30	0.9 Pct.	2.2 Pct.	3.1 Pct.	10.3 Pct.	3.1 Pct.
30	50	0.8	1.7	2.3	2.2	7.4
50	100	2.6	0.7	1.3	2.1	6.9
100	200	0.9	2.2	3.7	2.2	5.6
*200	.....	94.8	93.2	89.6	83.2	77.0

*By difference.

Rare Oxides Investigated for Cement Qualities

INVESTIGATION of oxides occurring less frequently in nature is suggested by the Bureau of Standards, Department of Commerce, to those seeking to produce a quick-hardening cement.

Recently there has been considerable unrest in the cement industry brought about by the lack of early strength in portland cement, and there has developed a feeling that it will be possible to manufacture a quick-hardening cement from the materials ordinarily used in making portland cement.

Form Manufacturers' Division of Sand and Gravel Association

A PRELIMINARY meeting of the exhibitors at the January convention of the National Sand and Gravel Association was held at the Book-Cadillac hotel in Detroit, September 21. C. H. Ray, Jr., of the Ray Sand and Gravel Co., Detroit, and Earl Zimmerman, of the Ohio Gravel Ballast Co., Cincinnati, presided. About 20 representatives of machinery and equipment manufacturers were present and a lively discussion took place as to the details of the convention program and exhibit.

The upshot of the meeting was the organization of the exhibitors into a manufacturers' division of the National Sand and Gravel Association, which will endeavor to promote a fraternal spirit among the exhibitors, coordinate the exhibits, and assist the convention committee in the handling of many details in connection with the exhibits.

Every representative present was called upon for suggestions and criticisms and the discussion was productive of many good ideas. H. M. Davidson, of the Hayward Co., New York City, was elected temporary chairman of the meeting to proceed with the organization of the manufacturers' division. A committee consisting of M. B. Garber, representing the Thew Shovel Co., Lorain, Ohio; E. P. Escher, Stephens-Adamson Manufacturing Co., Aurora, Ill., and Nathan C. Rockwood, editor-manager, ROCK PRODUCTS, Chicago, Ill., was appointed to assist Mr. Davidson in the organization of the manufacturers' division, and to work with the local convention committee headed by C. H. Ray, Jr.

The exhibitors will be asked to attend a meeting at the Detroit convention in January to perfect the temporary organization now in effect.

Those present were:

Deister Machine Co., Fort Wayne, Ind., Irwin F. Deister.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., C. M. Davis.

Stephens-Adamson Manufacturing Co., Aurora, Ill., E. P. Escher.

Cross Engineering Co., Carbondale, Penn., W. S. Nichol.

W. S. Tyler Co., Cleveland, Ohio, Albert E. Reed.

New Jersey Wire Cloth Co, Trenton, N. J., E. R. Emerson.

Link-Belt Co., Chicago, Ill., C. S Huntington

F. M. Welch Engineering Service, F. M. Welch.

Sauerman Bros. Co., Chicago, Ill., D. D. Guilfoil.

Mead-Morrison Manufacturing Co., Chicago, Ill., P. T. Redfern.

Thew Shovel Co., Lorain, Ohio, M. B. Garber.

Heil Co., Milwaukee, Wis., R. L. Diereksmeier.

Greenville Manufacturing Co., Greenville, Ohio, F. M. Welch.

Chain-Belt Co., Milwaukee, Wis., L. M. Campbell.

Hayward Co., New York City, H. M. Davidson.

Walter S. Bryde Co., Detroit, Mich., Walter S. Bryde.

F. L. Ward, Detroit, Mich., H. Rice-Wray.

Fono Flexible Coupling Co., Royal Oak, Mich., Martin D. Heaphy.

Consolidated Concrete Machinery Co., Adrian, Mich., J. H. Rhodes.

ROCK PRODUCTS, Chicago, Ill., Nathan C. Rockwood.

The National Sand and Gravel Association was represented by V. P. Ahearn, executive secretary, and Stanton Walker, head of the engineering bureau.

Michigan Producers Meet

On the day preceding the manufacturers' meeting the Michigan Sand and Gravel Producers' Association held a meeting and completed arrangements for the annual convention of the national association in January. L. E. Williams, general superintendent of the Ray Sand and Gravel Co., was placed in general charge of the convention arrangements and entertainment.

The following producers were present:

Ray Sand and Gravel Co., Detroit, Mich., C. H. Ray, Jr.

Puritan Sand and Gravel Co., Tecumseh, Mich., Frank Sutton and James Wilson.

Grand Rapids Sand and Gravel Co., Grand Rapids, Mich., H. N. Battjes.

Greenville Gravel Corp., Brighton, Mich., F. H. Grant.

Detroit-Oxford Gravel and Stone Co., Oxford, Mich., Harry Smith.

Standard Sand and Gravel Co., Pontiac, Mich., Frank Slater.

Midland Sand and Gravel Co., Midland, Mich., O. E. Gooding and A. Reed.

Ward Sand and Gravel Co., Oxford, Mich, L. J. Dyament.

Ohio and Michigan Sand and Gravel Co., Toledo, Ohio, W. F. Bradley.

Tecumseh Gravel Co., Tecumseh, Mich., C. B. Hancock.

Cass City Sand and Gravel Co., Cass City, Mich., E. L. Schwaden.

Greenville Gravel Corp., Lansing, Mich., Frank Hoff.

Greenville Gravel Corp., Kalamazoo, Mich., C. Gray.

Greenville Gravel Corp., Brighton, Mich., F. H. Grant.

Acme Concrete Products and Gravel Co., Cement City, Mich., E. W. Dienhart.

L. J. Dyament, of the Ward Sand and Gravel Co., was appointed chairman of the publicity and entertainment committee.

One session of the convention (January 3, 4 and 5, 1928) will be devoted to superintendents and operating men, and all gravel plant owners and executives are especially urged to bring their superintendents to the convention, both as a reward for faithful service and for the educational advantages.

Southern Sand and Gravel Co. Ready to Operate

A RECENT report in the *Sanford* (N. C.) *Express* states that the new gravel plant at Upper Little River township, under construction by the Southern Sand and Gravel Co., is almost completed and will go into operation about October 1. The foundation proper and the structure for the plant buildings are already completed and the equipment installed. The cost of the plant, including machinery, is given at $75,000.

The company, recently organized with A. L. Lyon as president, is incorporated in Delaware for $400,000. It owns approximately 315 acres, all of which are said to have been prospected and proved gravel deposits. The Atlantic and Western railroad is laying 1⅛ miles of track from its main line to the plant proper. Initial daily capacity of the plant will be from 15 to 20 cars of washed gravel, sand and clay gravel. Shipments will be made over four railroad lines.

The plant was designed by Cooley and Marvin of Boston. A pipe line 3200 ft. long will be run from Fish creek from a dam containing 8,000,000 gal. of water to an upper dam or reservoir containing 2,000,000 gal. of water designed by the company. W. M. Cooke, the company resident engineer, designed the dam and also made the survey of the property.

Xenia Gravel Co. Installs New Equipment

NEW equipment has recently been installed by the Xenia Gravel Co., Xenia, Ohio, in its gravel pit at Xenia. This modern equipment, which was made by Sauerman Bros., Chicago, Ill., makes this plant one of best equipped in the state. In the new layout the gravel is carried from the bottom of the pit, which is 65 ft. deep, to the top of a 70 ft. shaft, from where it is distributed to the bins. The gravel is accurately graded and deposited in three large storage bins. Three trucks can be loaded from each bin at the same time, and it only requires three minutes to load a truck. The daily capacity of the plant is 200 yd. of gravel. W. T. Wroe is manager for the Xenia company.

New Platte River Gravel Pit

DANIEL H. MERRITT AND SONS, Lincoln, Neb., are reported to have purchased a 38-acre tract along the Platte river, north of Plattsmouth, Neb., which will be developed for its sand and gravel resources. The consideration was stated at $10,000.

Construction of new trackage to the pit is expected to begin shortly and will be followed by a screening plant. The Merritt company are contractors and dealers in road and building material at Lincoln.—*Omaha* (Neb.) *World-Herald.*

S. E. Flexer of Egyptian Portland Leaves for North Carolina

S. E. FLEXER, superintendent of the Egyptian Portland Cement Co.'s mill at Fenton, Mich., which has ceased to operate on account of a shortage of marl, is leaving Fenton with his family for North Carolina at Newbern to make their home. Mr. Flexer, together with three other men, including the governor of North Carolina, have leased some 6000 acres of limestone lands for manufacture of cement. They are about to erect a large cement plant which will be the only cement plant in either North or South Carolina. Mr. Flexer is well known in the cement industry and is recognized as one of the most capable men in the business. The many friends of both Mr. and Mrs. Flexer regret their leaving Fenton and wish them both success and happiness in their new home and location. — *Fenton* (Mich.) *Courier*.

More Responsibilities for W. Scott Eames

THE many friends of W. Scott Eames, general manager of the New Haven Trap Rock Co., New Haven, Conn., a past-president of the National Crushed Stone Association, and always influential in its councils, has been chosen president of the Connecticut United States Bond and Mortgage Corp., with temporary offices at 9 Center St., New Haven, at a recent meeting of the board of directors. At the same time William R. Hoppen and George F. Barnes, local business men, were elected to the board. The corporation, whose capitalization is $1,000,000, has announced that its central office, heretofore at Stamford, will be located at New Haven.

At the directors' meeting also William G. Morris, former president of the Connecticut corporation, was named vice-president and general manager, having resigned the presidency.

The Connecticut United States Bond and Mortgage Corp. has offices in Hartford as well as in Stamford and New Haven and Waterbury. It confines its investments to small amortized second mortgages on completed homes and income producing property in amounts not exceeding $15,000.

The corporation is affiliated with five other corporations in Pittsburgh, Boston, Brooklyn, Newark and Albany, all of which cover certain territories in the different eastern states and go under the same name of "United States Bond and Mortgage Corp." In addition it and its sister companies are affiliated with a parent corporation, the United States Bond and Mortgage Corp. of New York City, with offices on East 41st St., whose capital stock is over $4,000,000.

The establishment of the Connecticut corporation follows out a plan originated in 1926 by the New York firm, according to which it is planned to locate offices all over the United States with the purpose of nationalizing the second mortgage business. Charter rights have already been reserved in 30 states throughout the country other than those in which its corporations are now in existence.

Mortgages accepted by the Connecticut United States Bond and Mortgage Corp. are not offered for sale but may be assigned to the parent organization in New York, which trustees the mortgages and issues

W. Scott Eames

guaranteed collateral trust certificates by the sale of which it regains its capital, which is then available for further investment.

W. Scott Eames is well known in successful business circles throughout the state. He is associated with J. B. Savage in the B. B. Savage Co., and is also interested with Mr. Savage in the New Haven Upholstery Co. He is president of the New Haven and Shore Line Railway Co. and general manager of the New Haven Trap Rock Co.

Dr. W. B. Jones Named Alabama State Geologist

DR. WALTER B. JONES, whose article "Making Lime in Alabama" appeared in Rock Products of September 17, has been appointed state geologist of Alabama to succeed the late Dr. Eugene A. Smith. Dr. Jones had been associated with Dr. Smith in the state geological work for some time, having been assistant geologist for several years.

New York Plant of Atlantic Gypsum Products Co. Burned

FIRE of an unknown origin practically destroyed the New York City plant of the Atlantic Gypsum Products Co., Boston, Mass., at 150th street and the East river, New York, early on the morning of September 17. The plant is surrounded by lumber yards, but the work of the firemen and a fireboat on the river prevented the blaze from spreading to these, although the Atlantic company's plant was totally burned. It is unofficially reported that the damage may exceed $100,000.

The plant was formerly operated by the Rock Plaster Corp. and when that company was merged into the Atlantic Gypsum Products Corp. in 1926, it was taken over and made the terminal for water shipments from the Portsmouth, N. H., plant into markets about New York City.

New Zealand Wants Plaster Materials

ACCORDING to the current report sent out by the U. S. Department of Commerce, Washington, D. C., there have been requests received from purchasers in New Zealand for quantities of plaster of paris and other plastering materials to be shipped to that country. Information concerning these requests may be obtained from the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., by referring to Inquiry No. 27,309.

Frank C. Wight

THE cement industry and the concrete construction industry has suffered the loss of a good friend and earnest advocate in the death, at his home in Summit, N. J., on September 18, of Frank C. Wight, editor of *Engineering News-Record*. Although but 45 years of age, he had long been recognized as a leading authority on all details of concrete design and construction.

The editor-manager of Rock Products has suffered the personal loss of a good friend, one to whom he is much indebted for his start in an editorial career, for his first experience as an editor was as an associate of Frank Wight on the staff of *Engineering News*.

Frank Wight was a genial friend of many readers of Rock Products. His circle of friends and acquaintances in the engineering profession was international. He had much to do with bringing cement and concrete aggregates to the fore in the American Society for Testing Materials. He was ever a hard worker in the building up of the American Concrete Institute.

His career in his chosen and beloved profession of technical journalism was brilliant, and gave promise of much greater achievement in the years to come.

Frederick W. Kelley Becomes Member of A. E. S. C. Executive Committee

FREDERICK W. KELLEY, president of the North American Cement Corp., Albany, N. Y., a past-president of the Portland Cement Association, has been elected a member of the executive committee of the Amer-

Frederick W. Kelley

ican Engineering Standards Committee as the representative of the Portland Cement Association, which has recently become a member of A. E. S. C.

The Portland Cement Association, which was organized in 1902, now maintains 31 district offices covering the United States and British Columbia. The association is spending a very large amount annually in research and standardization activities. Two-thirds of its 490 employes are experienced engineers. At its laboratory some 45,000 tests are being made annually to learn more about the best ways to use cement in concrete work. These facts are then broadcast to aid cement users.

Mr. Kelley is a graduate in mechanical engineering of Cornell University (1893) and from its early days was a leader in the Portland Cement Association in bringing the industry's engineering and technical problems to the fore. He was president of the association, 1923-24.

Batesville Lime Company to Add Three Kilns

ACCORDING to announcement of Geo. T. Weigart, president of the Batesville White Lime Co., Batesville, Ark., plans have been completed for the immediate construction of three additional kilns at the company's plant at Limedale, Ark., at an estimated cost of $150,000.

The new kilns will bring the total capacity up to 1500 bbl. per day, one of the largest lime burning operation in the southwest. The present plant, which was completed in June, 1925, comprises three direct fired kilns with a capacity of 600 bbl. per day. Wood is used for fuel in the old units, but the new kilns will use producer gas, and will embody all the latest developments in kiln design. It is expected that new units will be completed and in operation before January 1, 1928.

American Portland Plans Novel Hook-up of Mill and Products Plant

THE American Portland Cement Co., a recently organized $2,500,000 corporation, has opened offices in the W. P. Story building, Los Angeles, and contemplates the speedy erection of a $750,000 cement producing plant in Cajon Pass near San Bernardino, Calif. Several building material plants and distributing stations also will be erected by the firm in Los Angeles and other southern California cities.

Arrangements are reported to have been completed by the cement company to lease ten acres of land situated in the southwesterly section of Los Angeles as the site for a $250,000 cement products manufacturing plant. At this proposed plant the company will manufacture various building material products invented and patented by W. H Houghton, a resident of Los Angeles.

Officers of the American Portland Cement Co. are: Briant S. Young, president; Max O. Miller, vice-president, and U. J. Rogers, secretary and treasurer. Mr. Houghton, who also is a member of the firm, will supervise the manufacture of all the cement products. —*Los Angeles* (Calif.) *Times.*

Quarry Company Adopts Group Life Insurance

THROUGH co-operation with their employer, approximately $100,000 of group life insurance has been established for the employes of the East Quarry Co., of Glencoe, Ala. The contract is under the administration of the Metropolitan Life Insurance Co. and, besides the life insurance, provides for the payment of liberal sick and accident benefits.

Under the schedule of insurance benefits, each subscribing employe receives $1,000 life insurance, and payments of $7.50 a week through the health and non-occuptional accident policy. These weekly benefits will continue, in each case of disability, for a maximum of twenty-six consecutive weeks.

If total and permanent disability occurs before age 60, an employe will receive the full amount of his life insurance in monthly installments.

J. R. Thoenen Joins Bureau of Mines Staff

J. R. THOENEN, mining engineer, who has specialized in limestone mining, has joined the staff of the United States Bureau of Mines under Dr. Oliver Bowles, head of the Nonmetallic Experiment Station, New Brunswick, N. J. Mr. Thoenen will be remembered by ROCK PRODUCTS readers as the author of a series of articles on limestone mining. Subsequently he was employed to make a more extensive study of limestone mining for the United States Bureau of Mines, and his report on this was published during the current year. It is the most authoritative treatise on the subject.

For the past year or so Mr. Thoenen had been in Greece developing a magnesite mine. He now joins the permanent engineering staff of the Bureau of Mines, with headquarters at New Brunswick, N. J. His im-

J. R. Thoenen

mediate work will deal more particularly with a further study of the application of wire saws to the slate quarrying industry, and other dimension stone-quarrying industries to supplement the data contained in a recent publication of the Bureau.

Oxwelded Roof Trusses

A REPORT on the design, development, fabrication and testing of a series of oxy-acetylene welded roof trusses of the Fink type has been recently published by the Linde Air Products Co., New York, under the title of "Oxwelded Roof Trusses." It gives information to engineers and others on the possibilities in the oxy-acetylene weld as a method of joining steel. Several attached appendices furnish data on stress distribution, costs and procedure control.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Allentown Portland Cement Co. (common)[32]	May 24	.....	1½	3	
Allentown Portland Cement Co. (6% bonds, 1932)[32]	May 24	.....	87	92	
Alpha Portland Cement Co. (common)[2] new stock	Sept. 26	No par	33	36	75c quar. July 15
Alpha Portland Cement Co. (preferred)[2]	Sept. 26	100	115	.....	1¾% quar. June 15
American Lime and Stone Co. (7% bonds, 1942)[32]	May 24	.....	39	39½	
Arundel Corporation (sand and gravel—new stock)	Sept. 27	No par	44	44⅜	50c Oct. 1
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	Sept. 28	.....	119	122	
Atlas Portland Cement Co. (common)[2]	Sept. 26	No par	41	43	50c qu. Sept. 1
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% quar. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	Sept. 26	33⅓	43	.....	2% quar. Oct. 1
Beaver Portland Cement Co. (1st Mort. 7's)[8]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (Class A)[4]	Sept. 23	.....	36	36¼	75c quar. Aug. 1
Bessemer Limestone and Cement Co. (6½% bonds)[4]	Sept. 23	.....	100	101	
Boston Sand and Gravel Co. (common)	Sept. 23	100	81	.....	1% qu., 2% ex. Jan. 1
Boston Sand and Gravel Co. (preferred)	Sept. 23	.....	.....	85	1¾% quar. Jan. 1
Boston Sand and Gravel Co. (1st preferred)	Sept. 23	.....	.....	90	2% quar. Jan. 1
Canada Cement Co., Ltd. (common)	Sept. 27	100	243	244½	1½% quar. Oct. 17
Canada Cement Co., Ltd. (preferred)[11]	Sept. 23	100	123	124	1¾% quar. Aug. 16
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	Sept. 23	.....	101½	102½	3% semi-annual A&O
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	Sept. 23	100	97	100	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Sept. 26	No par	32½	.....	50c Jul. 11, 50c ex. Au. 10
Charles Warner Co. (preferred)	Sept. 26	100	106	.....	1¾% quar. July 28
Cleveland Stone Co. (new stock)	Sept. 27	.....	55	60	
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	Sept. 23	100	105	.....	50c qu. June 15
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Sept. 28	100	97	99	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Sept. 28	100	94	98	
Consumers Rock and Gravel Co. (1st Mort. 7s)[13]	Sept. 22	100	99½	101½	
Coosa Portland Cement Co. (6% bonds, 1944)[32]	May 24	.....	70	.....	
Coplay Portland Cement Co. (6% bonds, 1941)[32]	May 24	.....	88	.....	
Dewey Portland Cement Co. (1st mort. 6's 1942)[30]	Sept. 15	100	99	.....	
Dolese and Shepard Co. (crushed stone)[7]	Sept. 27	50	100	103	$1.50 July 1, $1 ex. July 1
Egyptian Portland Cement Co. 7% pfd.[21]	Sept. 23	.....	85	90	1¾% quar. July 1
Egyptian Portland Cement Co. (common)[21]	Sept. 23	.....	6	7	40c quar. Oct. 1
Fredonia Portland Cement Co. (6½% bonds, 1940)[32]	May 24	.....	97	101	
Giant Portland Cement Co. (common)[2]	Sept. 26	50	50	55	
Giant Portland Cement Co. (preferred)[28]	Sept. 26	50	40	45	3½% June 15
Ideal Cement Co. (common)	Sept. 27	No par	90	92	$1 quar. Oct. 1
Ideal Cement Co. (preferred)[33]	Sept. 27	100	110	112	1¾% quar. Oct. 1
International Cement Corporation (common)	Sept. 27	No par	56	56	$1 quar. Sept. 30
International Cement Corporation (preferred)[2]	Sept. 27	100	110	112	1¾% quar. Sept. 30
Kelley Island Lime and Transport Co.	Sept. 13	100	165	180	$2 quar., $2 ex. Oct. 1
Lawrence Portland Cement Co.[2]	Sept. 26	100	97	101	2% quar.
Lehigh Portland Cement Co.[6]	Sept. 26	50	112	116	1½% quar.
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1928 to 1931)[13]	Aug. 12	100	99½	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1932 to 1935)[13]	Aug. 12	100	97½	99	
Marblehead Lime Co. (1st Mort. 7's)[14]	Sept. 23	100	100	.....	
Marblehead Lime Co. (5½% notes)[14]	Sept. 23	100	98	.....	
Michigan Limestone and Chemical Co. (common)[6]	Sept. 26	.....	.....	26	
Michigan Limestone and Chemical Co. (preferred)[6]	Sept. 26	.....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Sept. 27	25	38	39	50c Aug. 1
Monolith Portland Cement Co. (common)[9]	Sept. 22	.....	12¼	12¾	8% ann. Jan. 2
Monolith Portland Cement Co. (units)[9]	Sept. 22	.....	31	32½	
Monolith Portland Cement Co. (preferred)[9]	Sept. 22	.....	9¼	9¾	
National Gypsum Co. (common)[35]	Sept. 27	.....	53	56	
National Gypsum Co. (preferred)[35]	Sept. 27	.....	83	86	
National Gypsum Co. (pref. carrying acc. div.)[35]	Sept. 15	.....	86	88	
Nazareth Cement Co.[20]	Sept. 23	No par	32	34	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	Sept. 23	.....	110	110	
Newaygo Portland Cement Co. (6½% bonds, 1938)[32]	May 24	.....	100	102	
New England Lime Co. (Series A, preferred)[14]	Sept. 23	100	.....	95	
New England Lime Co. (Series B, preferred)[22]	Sept. 26	100	97	99	
New England Lime Co. (V.T.C.)[22]	Sept. 26	.....	33	35	
New England Lime Co. (6s, 1935)[14]	Sept. 23	100	98	100	
New York Trap Rock Corp. (6% bonds, 1946)[32]	Sept. 27	.....	100¼	100½	
North American Cement Corp. 6½s 1940 (with warrants)	Sept. 27	100	87¾	87¾	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[32]	July 14	.....	60	65	2 mo. period at rate of 7%
North American Cement Corp. (common)[19]	Apr. 9	.....	8⅛	9	
North American Cement Corp. (preferred)	Apr. 25	.....	.....	.....	1.75 quar. Aug. 1
North Shore Material Co. (1st Mort. 6's)[16]	Sept. 28	100	99	.....	
Pacific Portland Cement Co. (common, new stock)	Sept. 23	.....	25	.....	
Pacific Portland Cement Co., Consolidated[5]	Sept. 22	100	61¾	.....	25c mo.
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[5]	Sept. 23	100	98½	.....	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	Sept. 23	10	5	5⅜	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[29]	Sept. 27	100	99	98½	
Pennsylvania-Dixie Cement Corp. (preferred)[29]	Sept. 28	100	93	.....	1¾% Sept. 15
Pennsylvania-Dixie Cement Corp. (common)[29]	Sept. 27	.....	23⅞	24½	50c Oct. 1
Petoskey Portland Cement Co.[1]	Sept. 27	10	11	11½	1½% quar.
Pittsfield Lime and Stone Co.[31]	Apr. 26	.....	.....	100	
Pittsfield Lime and Stone Co.[31] (common)	Feb. 25	.....	.....	25	

(CONTINUED ON PAGE 91)

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbitt, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]William C. Simons, Inc., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York.

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS (Continued)

Stock	Date	Par	Price bid	Price asked	Dividend Rate
Riverside Portland Cement Co.	May 9	.....	165	.....	50c monthly, $1.50 ex. Aug. 1
Rockland and Rockport Lime Corp. (1st preferred)[34]	Sept. 23	100	101	.....	3½% semi-annual Aug. 1
Rockland and Rockport Lime Corp. (2nd preferred)[34]	Sept. 23	100	57	65	3% semi-annual Aug. 1
Rockland and Rockport Lime Corp. (common)[34]	Sept. 23	No par	.....	50	1¼% quar. Nov. 2
Sandusky Cement Co. (common)[1]	Aug. 2	100	125	135	$2 qu. July 1
Santa Cruz Portland Cement Co. (bonds)[6]	Sept. 25	.....	105	.....	6% annual
Santa Cruz Portland Cement Co. (common)[3]	Sept. 23	.....	85¼	.....	$1 quar., $1 ex. Jan. 1
Schumacher Wallboard Corp. (common)	Sept. 23	.....	24½	26	
Schumacher Wallboard Corp. (preferred)	Sept. 23	.....	26¾	27½	
Southwestern Portland Cement Co. (units)	May 11	.....	205	.....	
Superior Portland Cement, Inc. (Class A)[20]	Sept. 23	.....	48¼	.....	
Superior Portland Cement, Inc. (Class B)[20]	Sept. 21	.....	30	32	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	July 14	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	July 14	100	98	100	
United States Gypsum Co. (common)	Sept. 27	20	102½	108	40c quar. Sept. 30
United States Gypsum Co. (preferred)	Sept. 27	100	121¼	121¼	1¾% quar. Sept. 30
Universal Gypsum Co. (common)[3]	Sept. 28	No par	4½	5¼	
Universal Gypsum V.T.C.[3]	Sept. 28	No par	4	5	
Universal Gypsum Co. (preferred)[3]	Aug. 31	.....	40	.....	1½% Feb. 15
Universal Gypsum and Lime Co. (1st 6's, 1946)[3]	Sept. 28	100	100	96	
Union Rock Co. (7% serial gold bonds)[18]	Sept. 22	.....	99	101	
Upper Hudson Stone Co. (1st 6's, 1951)[32]	May 24	.....	93	.....	
Upper Hudson Stone Co. (1st 6's, 1937)[32]	May 24	.....	104	.....	
Vulcanite Portland Cement Co. (7½% bonds, 1943)[32]	May 24	100	98½	101	
Whitehall Cement Mfg. Co. (common)[36]	Sept. 23	.....	150	.....	
Wisconsin Lime and Cement Co. (1st Mort. 6s, 1940)[15]	Sept. 28	100	99	.....	
Wolverine Portland Cement Co.	Sept. 27	10	6½	7	15c quar. Aug. 15
Yosemite Portland Cement Co.	May 11	.....	7½	.....	

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend rate
Asbestos Corp. of Amer. (5 sh. pfd. and 5 sh. com.)[1]	June 22	.....	$1 for the lot		
Atlanta Shope Brick and Tile Co.[1]	Nov. 24	.....	25c	.....	
Benedict Stone Corp. (cast-stone) (50 sh. pfd. and 390 sh. com.)[1]	Dec. 29	.....	$400 for the lot	.....	
Blue Stone Quarry (60 shares)[2]	Mar. 16	.....	$10¼ for the lot	.....	
Coplay Cement Mfg. Co. (common) (4)	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred) (4)	Dec. 30	.....	70	.....	
Eastern Brick Corp. (7% cu. pfd.) (4)	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common) (4)	Dec. 9	10	40c	.....	
Edison Portland Cement Co. (common)[4]	Sept. 11	50	20c	.....	
Edison Portland Cement Co. (preferred)	Nov. 3	50	17½c(x)	.....	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Globe Phosphate Co. ($10,000 1st mtg. bonds, $169.80 per $1000 paid on prin.)	Dec. 22	.....	$50 for the lot	.....	
Iroquois Sand and Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.) (4)	Mar. 17	.....	$12 for the lot	.....	
Knickerbocker Lime Co.x	June 22	.....	100	.....	
Limestone Products Corp. (150 sh. pfd., $50 par, and 150 sh. com., no par)	Dec. 22	.....	$60 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼% semi-annual
Olympic Portland Cement Co. (g)	Oct. 13	.....	.....	£1½	
Phosphate Mining Co. (1)	Nov. 24	.....	1	.....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.) (1)	June 23	.....	$200 for the lot		
Rockport Granite Co. (1st 6's, 1934)[2]	Aug. 31	.....	90	.....	
Simbroco Stone Co.[2]	Apr. 20	.....	12	12	
Southern Phosphate Corp.[6]	Sept. 15	.....	1¼	.....	
Tidewater Portland Cement Co. (3000 sh. com.)	Dec. 22	.....	$6525 for the lot	.....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd. (4)	Nov. 3	.....	$1 for the lot	.....	
Wabash Portland Cement Co.[3]	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick) (5)	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. (1) Price obtained at auction by Adrian H. Muller & Sons, New York. (2) Price obtained at auction by R. L. Day and Co., Boston. (3) Price obtained at auction by Weilepp-Bruton and Co., Baltimore, Md. (4) Price obtained at auction by Barnes and Lofland, Philadelphia, Pa. (5) Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. (6) Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

Lawrence Portland Rights Offered

THE Lawrence Portland Cement Co., Siegfried, Penn., which will expand its new cement plant now under erection at Thomaston, Maine, will offer stockholders the right to subscribe on November 1 to 20,000 shares of its 45,000 shares of authorized unissued stock on the basis of one new share for each two and three-quarters shares held. Payment is to be made on December 15 or in four installments.

Cumberland Portland Bonds Offered

CALDWELL & CO., Fourth & First National Co. and J. W. Jakes & Co., Nashville, Tenn., are offering at 100 and interest $450,000 first mortgage (closed) 7% sinking fund convertible gold bonds of the Cumberland Portland Cement Co., Cowan, Tenn.

Dated Aug. 1, 1927; due Aug. 1, 1937. Redeemable all or in part, by lot on any interest date at 103 and interest.

The following data are from a letter of W. V. Davidson, president of the company:

Business and Property. Company, incorporated in 1926 in Delaware, operates a modern portland cement plant at Cowan, Tenn., one of three plants in the United States producing white cement. The plant has a daily capacity of 1400 bbl. of white cement or 2000 bbl. of gray cement. Property comprises 1100 acres of land, owned in fee; the buildings which house the cement mill, equipment and storage facilities; and the plant equipment, which includes the most modern wet process type of crushing, grinding and handling machinery. Limestone rock of a very high quality necessary in the production of either gray or white cement is quarried on the plant site, together with clay used in the manufacture of gray cement, while the clays used in the manufacture of white cement are shipped from west Tennessee.

Security. Direct obligation of the company and secured by a closed first mortgage on all of the property of the company. The depreciated reproduction cost of the buildings, machinery and equipment has been estimated by Ford, Bacon & Davis, Inc., at $1,421,767, which, together with the land, mill site, quarries and reserves, taken at cost of $196,000, makes the total value of the security $1,617,767, equivalent to more than $3,500 for each $1,000 bond of this issue.

Earnings. Based on the sale of 80,000 bbl. of white cement and 400,000 bbl. of gray cement per annum at the present production cost and sales prices, the estimated net earnings, before depreciation and Federal taxes, according to the report of Ford, Bacon & Davis, Inc., will be over $250,000 per annum, or approximately eight times the annual interest requirements of this issue of bonds.

Working Capital. Auditors' report as of July 31, 1927, shows that the company has current assets of $607,552, as against current liabilities of $361,258, or a net working capital of $246,293.

Sinking Fund. Indenture provides that company shall deposit in trust each month a sinking fund of 50c per bbl. on all white cement and 10c per bbl. on all gray cement manufactured and shipped by it during the preceding month. Certain minimum sinking fund requirements are also provided in the indenture. Based upon the estimated production and sales, the sinking fund will retire the entire issue before maturity, while the minimum operation of the sinking fund will be sufficient to retire over 70% of the bonds by maturity.

Capitalization	Authorized	Outstanding
First mortgage 7% bonds issue	$ 450,000	$ 450,000
Cumulative 7% preferred stock (par $100)	2,000,000	1,387,600
Common stock (no par value) shares	20,000	18,838

Convertibility. The bonds are convertible at par, at the option of the bondholder, into the 7% cumulative preferred stock of the company (par $100) at 90 during the first

five years and thereafter at 95.

Purpose. Proceeds of the sale of these bonds will be used to retire outstanding short-term obligations incurred by the company during construction of the plant and to provide additional working capital.

Management. Officers are W. V. Davidson, president; J. R. Greene, vice-president; N. N. Davidson, vice-president; H. M. Greene, secretary and treasurer, and R. T. Miller, general manager.

Offer $46,000,000 for Assets of Canada Cement Co.

DEFINITE and official details of the offer to shareholders of Canada Cement Co. are contained in a letter sent forward to shareholders under the signature of the president, F. P. Jones. The letter follows, in part:

"On September 14, 1927, there was received from Wood, Gundy & Co., Ltd., an offer to purchase all the outstanding shares of your company, paying for the same $125 per share for the preferred and $250 per share for the common, the offer being, of course, subject to verification of the assets, liabilities and average earnings of your company and the usual stipulations as to withdrawal of the same in the case of indications of war, international and national catastrophies or calamaties seriously affecting the company's business.

"Shareholders desiring to avail themselves of this offer would have had to deposit their share certificates within 30 days of the date of the notification to them of the offer, which meant that the certificaes would have to be deposited by about the middle of October. Your directors at a meeting held on September 15, 1927, approved of the offer in principle and decided that it was their duty to submit the offer to you with their recommendation for your acceptance.

"Wood, Gundy & Co., Ltd., further agree that if you accept this offer you will receive all the usual dividends paid on this stock up to November 21, 1927, and that they will take delivery and make payment for this stock on or before December 1, 1927.

"The respective offers have been unanimously approved at two meetings held on September 15, 1927, and September 20, 1927, by your directors, and all those present signified their intention of depositing their shares and they recommend you do the same.

"If the purchasers acquire the assets of your company, they have agreed to keep all funds and securities, etc., in what are known as the company employes' stock distribution fund and the company's pension fund intact to be used solely for the benefit of the employes of the company."

The announcement also called attention to the special general meeting of the stockholders scheduled for October 14 and had an enclosed form of proxy.

The identity of the prospective purchasers has not been revealed and many rumors are current. In quarters which are usually well informed the theory is that the offer came from a group of local financial houses, while another rumor mentioned Senator Raymond of the National Cement Co. (Canada) in conjunction with the Dupont interests of New York.

According to the last issued balance sheet, Canada Cement has outstanding 105,000 shares of preferred stock and 135,000 shares of common. At the offered price, this would make the price payable for the company $46,875,000, of which $13,125,000 is for the preferred stock and $33,750,000 for the common.

A comprehensive history of the company was published in Rock Products, April 2, 1927. This included the financial report for the year ended December 31, 1926. The stock issues of the company have been extremely active during the present year. On January 4 the price of the common was 132⅛ and of the preferred 117. At the present writing (September 28) the common is quoted at 244½ and the preferred at 124. The company is reported to be in a strong financial position, due to increased economies in cement manufacture and also because its subsidiary companies engaged in other lines of manufacture have been prospering.

Dunstable Portland Cement Co. (England) Report

REPORT to March 31 last states that since production commenced, trading profit from the Dunstable factory amounted to £19,326. After deducting depreciation reserve £5454, bank charges £2713 and directors' fees, head office charges, etc., £4209 there is carried forward £7007. It has not been found necessary to take advantage of the loan of £100,000 under the Trade Facilities Act. The purchase of the share capital of Smeed, Dean and Co. and Young and Son include the profits of those companies from December 1 and November 1, 1926, respectively, but no part of these is included in the present accounts. Premium on the new issue of 350,000 ordinary shares, amounting to £175,000, has been drawn upon to write off all expenses, not only of the new issue but of the original issue as well as the balance of the company's expenditure over revenue prior to the commencement of manufacture, leaving a premium reserve of £44,009. An interim dividend has been paid at the rate of 7½% per annum on the preference shares for the period from the respective dates of allotment up to and inclusive of June 30.

The plant at Dunstable has been running regularly since the beginning of this year, though as only natural in the case of a new factory with sundry adjustments, especially in connection with some of the subsidiary plants, it is the policy of the board to adopt every improvement which the experience of the plant in operation suggests. The improvements made since the first layout of the works in 1925 do not entirely complete requirements. Further work is in hand or in contemplation, chiefly in connection with an additional grinding mill, with independent storage arrangements, to meet the increasing demand for the company's rapid hardening cement "Rapard." It is expected that all these improvements and additions will be completed within the next few months.—*The Quarry & Surveyors & Contractors Journal.*

Calaveras Cement Co. Report

IN connection with issuance of a permit for Calaveras Cement Co. of San Andreas, Calaveras county, with offices in San Francisco, to sell 12,000 shares of common stock to Stuart L. Rawlings, a director, for $12,000, the company revealed new figures on its current position. At the present time a surplus of $21,786 is disclosed. Common stock outstanding, 103,544 shares, is held at $31,044 and preferred, of which there is 17,772 shares, at $1,777,200.

Relations of assets to current liabilities:

ASSETS

Cash	$ 5,391
Accounts receivable	208,097
Inventories	239,331
Plant, equipment, etc., less depreciation	1,918,977
Deferred charges	46,234
Total	$2,418,032

LIABILITIES

Accounts payable	$ 168,060
Interest	19,942
Long term notes	400,000
Total	$ 588,002
Net worth	$1,830,030

San Francisco (Calif.) *Chronicle.*

Time Extended for Briefs in Fluorspar Investigation

EXTENSION of time has been granted to interested parties to file briefs in the so-called fluorspar investigation, it was announced orally September 26 at the Tariff Commission. These briefs may be filed up to Oct. 10.

Extension was desired by a number of parties concerned in the investigation to permit further study of records in the case. The request came chiefly from the Bethlehem Steel Corporation and representatives of German producers of fluorspar, the latter claiming they have not had ample time to analyze the mass of data gathered by the commission in this country and abroad on production costs of fluorspar.

Diatomaceous Earth in British Columbia

THE large deposit of diatomaceous earth in the Fraser Valley, near Quesnel, B. C., is to be actively developed, if the plans of the Canadian Diatomite Co. materialize. Sample orders, amounting to a carload, will be shipped shortly, and it is hoped that these will be followed by larger and continuous shipments. Samples will be taken from different portions of four square miles of leased government land. The deposit is said to be 40 ft. thick, and has long been recognized as one of the most important occurrences of this mineral in Canada.—*Jour. Soc. Chem. Ind.* (England).

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

California Concrete Pipe Manufacturer Has Unique Way of Advertising Product

THE Concrete Pressure Pipe and Construction Co. of Gilroy, Calif., is one of the most attractive and efficient concrete pipe plants on the west coast. It has two acres of ground, flanked on one side of the state highway connecting Los Angeles and San Francisco, and on the other side by the main line of the Southern Pacific Railroad Co. The firm had the advantage of starting on a bare piece of land, so that it did not have to "build to" anything. Exactly one month after the crew broke the ground they began making pipe. During the month of preparation the Tuerck-MacKenzie pipe machine was installed, a curing floor of 2400 sq. ft. was poured and enclosed with a corrugated iron building, a spur track was installed, water pipe laid and bunkers built.

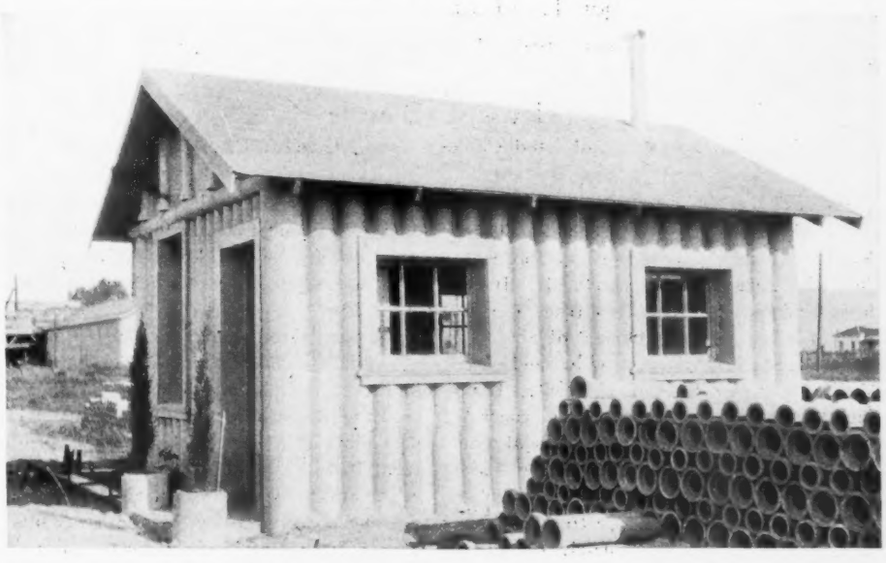
An Unusual Office Building

A few months later the company put up an office building which is somewhat unique, for it is built of concrete irrigation pipe set in an upright position. The walls are composed of three tiers of 8-in. irrigation pipe, 3-ft. lengths. The corner columns are of 10-in. pipe, the lowest tier set 6 in. below the surface of the ground and imbedded in concrete, thus making the foundation actually an integral part of the wall. The center and corner columns are filled with concrete and reinforced with ½-in. steel reinforcing rods. The floor is also of concrete. The result is that the thick walls and continuous air columns provide an office delightfully cool in the summer and equally comfortable in the winter. The interior was given a coating of white cement, and the outside a wash of light gray cement. With the borders of flowers around the building, and the two Italian cypress trees set in flower pots made of halves of 12-in. concrete irrigation pipe flanking the door, the office presents a very attractive appearance. Within the last month the company has added 1100 sq. ft. of covered floor space.

Good Plant Arrangement

The arrangement of the entire plant, from the very first, was made with an eye to efficiency and economy of labor. The cement and the sand are not more than 10 ft. from the mixer, and runways are provided for the wheelbarrows. The mixer is sunk below the floor level, thus enabling the men to dump the aggregate directly into the mixer. The concrete mix is then elevated to the feeder box by means of a power skip. The pallets are arranged according to size in small bins outside of the building next to the oiling tank. In this way they are conveniently placed, and the unsightliness of pools of black grease is eliminated from the interior of the building. Time is also saved, as it is not necessary to stack the rings.

The plant is equipped to manufacture machine-tamped concrete pipe in sizes ranging from 4-in. to 30-in. of the bell-end and the tongue-and-groove types. Two small machines turn out stubs and elbows for sewer pipe fittings, so that there is always a plentiful stock of T's, Y's and elbows on hand. The 30-in. tongue and groove pipe is manufactured for culverts, standpipes for irrigation lines and for septic tanks. The 8-, 10-, 15-, 18- and 30-in. pipe, both bell-end and irrigation, is manufactured in 3-ft. lengths. This longer length makes it possible to produce a greater number of feet per day, as well as to lay a correspondingly greater footage per day with fewer collars.



Cement pipe of varying length and sizes and made at the plant were used almost exclusively in the construction of this unique and attractive office building

The rings are oiled by immersing them in an oiling tank, which is made of a 30-in. concrete pipe, and then placed on a sloping rack to drain the excess oil back into the tank. The rings are handled by means of a hook which picks them up from the bins, dips them into the oil and lays them on the rack without removing them from the hook. Several roadways and runways in the yard make for saving of time and effort in loading pipe on to trucks, as well as removing it from the building.

Surplus Material Worked Up to Yield a Profit

The idea of efficiency goes even further at this plant, for none of the surplus material is wasted. The company nets a neat little income by making use of this surplus and that with only a very small outlay. Inexpensive metal forms have been made to order for various side lines, and in the eve-

Plant and pipe storage yard, Concrete Pressure Pipe and Construction Co., Gilroy, Calif.

nings the surplus concrete is worked up into a wet mix and poured into these forms. These side lines consist of flagstone of several shapes and sizes, two sizes of foundation blocks and 7½-ft. reinforced concrete fence-posts. The cost of manufacturing these articles is very little, considering the fact that they are made of material that would otherwise be wasted, and that the time required to make them is but little more than would be required to wheel it some distance from the building to dispose of it.

The Concrete Pressure Pipe and Construction Co. is an incorporated company, with the following as its offiers: Harry C. Scholten, president; E. F. Eastman, manager; G. W. Eastman, vice-president, and L. Scholten, secretary.

Status of Concrete Building Tile

A Paper Read at the Convention of the Ohio Concrete Products Association

By C. L. Bourne

Engineer, Consolidated Cement Corp., Cement City, Mich.

CONCRETE building tile are comparatively new in the products field. There has been some differences of opinion as to just what constitutes a concrete tile. It has been held that a tile differs from a block in that it has a greater amount of air space and consequently thinner webs and face shells. For the sake of simplicity, I am inclined to differentiate between concrete block and tile entirely on the basis of size. On this basis, accepting the standard size adopted by the division of simplified practice of the Bureau of Standards, a concrete block is a masonry unit approximately 7¾ in. in height 15¾ in. in length and 6, 8, 10 and 12 in. wide. A concrete building tile is a unit approximately 5 in. high, 12 in. long and 3¾, 8 or 12 in. wide. Excepting the far west, practically all concrete building tile are manufactured in the 8 in. width.

Ranges of Use

This size of concrete tile has the greatest range of uses of any concrete building unit. For bearing walls it may be used wherever block is permitted. It is admirably adapted for backup, curtain or partition walls, for its size allows perfect bonding with brickwork. It is often used without facing for warehouses, factories, the side walls of stores and garages and for farm building construction. In expensive buildings it is commonly used as backup for face brick or as a base for stucco.

Masons favor concrete tile more than other hollow concrete units. The hand hole in the top of the tile helps in handling it easily with one hand and the mason can lay it without dropping his trowel. It weighs from 16 to 22 lb. and it replaces six bricks in the wall. With a little training a mason lays more wall in a day than with any other unit. The support of craftsmen using a new building material is a very important factor in any locality where the material is being introduced for the first time.

Acceptable to Most Building Codes

Concrete building tile are permitted in most building codes on the same basis as concrete block. In fact, in some codes is found the statement that wherever the word concrete block is found it shall mean either concrete block or tile. The Hoover code, which is having more and more influence in standardizing code practices, places block and tile on the same basis. Codes, in general, specify that hollow concrete building units shall have a certain compressive strength per square inch of gross area. Because of the usual larger air spaces in tile than in block a concrete of greater strength is required to obtain the same compressive strength on gross area.

Strength Proved by Tests

Experiments at Columbia University first demonstrated that concrete building units had a greater efficiency in the wall than corresponding clay units. The following facts are found in Bulletin 12 of that university: "Assuming average conditions, a concrete brick having an average strength of 1500 lb. per square inch will, if laid in 1:3 cement mortar, form a masonry which will have an average compressive strength of 1210 lb. per square inch and an elastic limit of 690 lb. per square inch; a clay brick of a strength of 3000 lb. per square in. will develop in the form of masonry under identical conditions an ultimate strength of 1270 lb. per sq. in. and an elastic limit of 590 lb. per sq. in."

There was some doubt as to whether this relationship would be found in concrete tile masonry because of the small bearing area of the individual tile. To settle the question, similar tests upon concrete and clay building tile walls were conducted at the Structural Materials Research Laboratory, Lewis Institute, Chicago. The results showed that the efficiency of the concrete tile walls was 64% of the compressive strength of the individual unit compared with a corresponding wall efficiency of only 23% when clay tile were used and are even a better record with brick. The data upon which these conclusions are based are given in the table.

Fire Resistance

Concrete tile have demonstrated a high resistance to fire exposure. Two public demonstrations to show this resistance are noteworthy because of the carefulness with which they were prepared and the wide publicity they received. The first was held at Los Angeles, Calif., where a small house was built and filled with combustible materials, which were lit and burned to ashes.

The tile came through in fine shape. The most important feature of the demonstration was the manner of handling subsequent publicity. The story was written up in such fine shape that newspapers and trade journals printed very full and convincing accounts. A similar demonstration was held at Birmingham, Ala., in connection with Fire Prevention week. A committee composed of leading public officials, architects and business men was appointed to take charge of proceedings. The report of this committee containing individual letters from its members was a wonderful boost to the concrete tile industry at that place and has been extensively reprinted.

The National Stone-Tile Corp. recently has had standard fire tests made upon its product at the Underwriters' Laboratories at Chicago. The laboratories report was released a short time ago and is unquestionably the best ever granted to hollow concrete units. A remarkable feature of these tests was that most of the tile were composed of silceous aggregates, a type of aggregate which fire insurance officials have considered questionable for concrete likely to be exposed to fire.

Strong Selling Points

In competition, concrete tile have several convincing selling points. They are always true to shape, which results in speedy laying with a minimum of mortar. Their cells are laid vertical and no closures are necessary at corners or ends of walls. Their uniform quality measured in terms of strength and absorption appeal especially to discriminating achitects. Plants are usually situated close to the market where prospectiye customers may be invited to inspect the manufacturing processes, and from which prompt deliveries can be made. The cost of concrete tile masonry usually compares favorably with any type of reliable masonry. The finished wall has an even surface well adapted to the application of plaster or stucco.

With all of the advantages briefly summarized above, there is little wonder at in the rapid growth of concrete tile production. The most marked advances are found in the far west and the south, where concrete masonry was once discredited. These regions have few large cities. As a result most of the concrete block made were of the hand tamped, dirty aggregate, lean mixtured and sun cured variety. Block had not usually given a good account of themselves. People who wanted good construction would not buy block and building officials were skeptical of their merits. Along came concrete tile. Good equipment was necessary for their manufacture. Men of vision and ability saw their advantages. They built well designed plants. They either had or obtained sufficient finances to properly establish and develop the business. Where necessary they promoted good building code ordinances. From the very beginning their success was phenomenal. Four years ago, I do not know where there was a concrete products plant in the whole south producing standard concrete masonry units in appreciable quantities. There may have been a few. Today there is hardly a single southern city of any size which does not have a progressive concrete tile manufacturer. Equally good progress is being made on the west coast.

Possibilities in Concrete Tile

In this section of the country Detroit illustrates to best advantage the possibilities of concrete tile. Here the block business is well established and block are usud principally for foundations of small structures. Concrete tile is to a large extent used for back-up in bearing walls for apartment buildings and other large structures. Considerably over 10,000,000 concrete tile were made and sold in Detroit last year. These figures show the possibilities of this unit in other undeveloped markets in mid-western and eastern cities. Many of the architects specify concrete tile and many contractors are strong advocates. Several eastern cities have new tile plants and more will be heard from soon.

Concrete tile are made both by the dry tamped and wet cast methods. If the best results are to be obtained, a closer control of the manufacturing methods is necessary than for block, principally because of the thinner face and web sections. On the other hand the application of scientific principles of concrete design yield excellent profits.

Grading and Selection of Aggregate

Great care should be taken in the selection of aggregates. The amount of dirt or unsound particles in the aggregate has a greater proportionate effect upon the quality of the tile than in larger units. At first glance it would appear that the grading of the aggregate would be of small consequence, as the range of possible gradings is so small. The mixtures are, however, comparatively rich and slight differences of grading have a significant effect on the amount of cement necessary to make tile of standard strength. I have in mind one concrete tile company whose investigations and experiments upon the grading of available aggregates extended over a period of more than a year and a half. Constant improvements were made and finally a saving of 3.3 bbl. of cement per thousand tile was gained over the first mixtures used. The tile from this plant test several hundred pounds over code requirements. It is of course obvious that results of this sort can be obtained only where the source of supply can maintain a uniform standard of grading.

The machines used for dry tamped tile are of practically the same design as for block except that two, three or four tile are made in one operation. Machines are on the market for a rather large range of daily production, the smallest turning out 2500 tile.

In the dry-tamp process, water should be controlled within narrow limits. A slight excess causes the light tile sections to slump, while a dry mixture seriously reduces strength. I recently made a short series of tests upon concrete tile for the committee on concrete building units of the American Concrete Institute. The batch used to represent one condition of test was perceptably drier than those representing similar conditions. All the mixtures except this one batch produced tile showing moisture upon the surface upon removal from the molds. The dry batch resulted in tile with a strength 25% lower than it should have been. This incident impressively bears out the same water relationship found in other more extensive investigations.

Many of the cast tile are being made by the "Stone-tile" patented method. Wet concrete is placed in molds so designed that they can be removed immediately after the concrete is placed. The tile are cast in the open on sand casting beds. In 24 hours they are stacked in piles which are cured by a system of sprays on overhead pipes. The "Stone-tile" system has been used widely in California and in the south where there is no danger of damage to the tile by frost during the initial hardening period. Another system of making cast tile which is being successfully used is the "Flam-tile." After the molds have been filled they are placed in a curing chamber at high temperature for three or four hours before the tile are removed. The cast processes permit the design of the concrete by the direct water ratio method.

In this discussion, details have been purposely omitted. The intention has been to give a general picture of the concrete building tile industry at the present time unobscured by minor factors and to enumerate some of the advantages of the product so that you may judge for yourself its rightful place among concrete masonry units.

TESTS MADE ON CLAY AND CONCRETE TILE WALLS BY THE STRUCTURAL MATERIALS RESEARCH LABORATORY, LEWIS INSTITUTE, CHICAGO

Wall No.	Kind of Tile	Dimensions of Wall Sections in Inches Width	Length	Height	Average Compressive Strength of Individual Tile lb. per sq. in. of Gross Area	Average Compressive Strength of Wall in lb. per sq. in. of Gross Area	Efficiency of Wall Section as Compared with IndividualUnit
1	Concrete	8.0	24.0	15.2	1350	670	50%
2	Concrete	7.9	24.0	15.2	1350	740	55
3	Concrete	11.9	16.0	15.3	1350	800	59
4	Concrete	11.9	12.0	15.5	1350	1080	80
5	Concrete	7.9	12.0	15.5	1350	1040	77
							Avg. 64.2
6	Clay	8.4	26.4	17.0	630	120	19%
7	Clay	8.4	26.4	15.9	630	170	27
							Avg. 23

Foreign Abstracts and Patent Review

Rapid Determination of Lime in Limestone, Slag, Raw Cement Mix, Clinker and Cement.

The following methods are enumerated by Hans Pinse:

1. The sulphate or nitrate ignition method described by Kuhl and Klasse, *Zement,* (1926), 385.

2. The back titration method by the same authors.

3. The oxalate method of Tremmel, *Zement,* (1926), 305.

4. The perchloric acid method of Dr. Passow with subsequent titration of the lime or determination of the residue by loss on ignition or carbon dioxide determination.

5. The sodium-phosphate method of Stumpf.

6. The precipitation method described by Richarz, *Zement,* (1926), 407.

7. The acetic acid method, with or without elimination of silica. As is known, an admixture of acetic acid prevents the precipitation of iron, alumina and manganese by ammonia. Lime may be completely recovered from a solution of this kind by following these conditions: A 0.5 gm. sample is mixed in a 300 cc. beaker with 15 cc. hydrochloric acid to which are added a few drops of bromine water to oxidize the iron and the mass evaporated to dryness on a sand bath. It is then heated to about 130 deg. C. for 10 minutes, taken up with 12 cc. dilute hydrochloric acid and further diluted with 30 cc. water and filtered rapidly into a 500 cc. beaker. The filter is washed with hot water until the wash water gives no test for chloride. The filtrate is then diluted to 400 cc. and 10 cc. of 10% tartaric acid added and treated with ammonia, during which no precipitate should form. It is now heated to the boiling point and the lime precipitated with 30 cc. of a hot 10% solution of ammonium oxalate (3 gm. ammonium oxalate). After bringing it to the boiling point, the precipitate, which should be crystalline, is allowed to stand for 5 minutes. It is then filtered while hot; and the beaker and filter washed 4 times with a boiling ammonium oxalate solution (2 gm. ammonium oxalate per liter of water) and subsequently with boiling water. The precipitate is now placed in the original beaker and to it is added 400 cc. of water, previously heated to 90 deg C., and 30 cc. dilute sulphuric acid (1:3). It is titrated, after distributing the precipitate by careful stirring, with permanganate solution.

When no regard is to be paid to silica, a 0.5 gm. sample is placed in a 500 cc. beaker, mixed with 15 cc. dilute hydrochloric acid, a little bromine water added and heated for about 10 minutes then diluted to 400 cc. after which 10 gm. tartaric acid are added and the procedure as above continued.

8. The oxalic acid method. This method was described by Buskett, Mines and M., vol. 28, p. 289, 1908.

9. The back titration method was introduced by Balthasar, *Chemiker-Zeitung,* p. 646, 1909. This method can be used to determine lime in the presence of silica. The ammoniacal solution is decomposed by a fixed amount of oxalic acid, the lime oxalate filtered off and the filtrate treated with permanganate. This gives the amount of oxalic acid unused and after subtraction from the original amount added, the combined oxalate is fixed and the lime calculated.

10. The ammonium chloride process of Desgraz, (*Chemiker-Zeitung,* p. 1313, 1909) is not a titration method. The oxides of lime and magnesia on treatment with a concentrated ammonium chloride solution are converted to chlorides, which being soluble are easily filtered off from the uncombined silica, etc., in the original sample. From here the lime is determined in various gravimetric ways. The process is limited to limestones because the lime in cements, slags, etc., is combined as a silicate.

11. The gas analysis method is based on the determination of carbon dioxide, which permits a computation of the lime present as calcium carbonate and magnesium carbonate, and gives a rapid determination of lime. Various devices designed for this purpose are sufficiently familiar; among these are those of Scheibler-Dietrich, Lunge, Paul Klees and others.—*Zement* (1927), 591-94.

Constitution of Clinker and Composition of the Raw Mix. According to Rankin and other American scientists, hardening of cement is caused by the hydration of calcium silicates, particularly of the tricalcium-silicate, which represents the alite. Dyckerhoff states normal temperatures of calcination result in little or no $3CaO \cdot SiO_2$. Tests were made to determine: (1) Whether the limit of soundness of a normally sintered portland cement clinker lies at the molecular ratio of SiO_2 to CaO of 1:3 or lower. (2) If the lower limit is found to be accurate, does a higher temperature of sintering, i.e., fusion of clinker result in raising this limit through the formation of tricalcium-silicate and consequent increase in activity of clinker?

The method used was based on the determination of free lime, according to White (*Journal of Chemical Industry,* 1909, p. 5). Calcium phenolate is formed by the CaO of the clinker and phenol in a solution of nitrobenzol. The reagent consists of 5 gm. phenol, 5 gm. nitrobenzol and 2 drops distilled water. The presence of lime results in a few minutes in the formation of needle-shaped crystals of calcium phenolate characterized by strong double refraction. Preliminary tests were made to determine the time in which the crystals appear in different substances. A number of clinkers of pure SiO_2, Al_2O_3 and $Ca(CO)_3$ were calcined in Series I. The molecular ratio of SiO_2 to CaO was varied from 1:2.4 to 1:3.0, the alumina content remaining constant. The temperature was in each case carried from incipient sintering to complete fusion.

Similarly, there were obtained products of fusion of $Fe_2O_3 \cdot CaO$ compounds and $Fe_2O_3 \cdot CaO \cdot SiO_2$ compounds, which constituted Series II. The effect of MgO on the limit of unsoundness was established in Series III. The samples were made to pass through a 10,000-mesh sieve. They were fused in an oxy-hydrogen blast.

Series I gave the following conclusions: Normally sintered clinkers showing alite structure remain sound throughout up to a molecular ratio of 1:2.59. This phenomenon seems to agree with Dyckerhoff's statement that alite is a β bicalcium-silicate with about 0.5 mol CaO in solution. The fused clinkers showed a composition closely approaching the formula $8CaO \cdot 2SiO_2 \cdot Al_2O_3$. Fusion had no effect on the unsoundness limit.

All lime-iron oxide compounds of Series II, containing less than two mols of lime per one mol Fe_2O_3, remained sound. Lime in excess of this amount reacted as "free lime." Consequently the lime of portland cement clinker capable of reaction with iron oxide bears the molecular ratio of 2:1. The limit of unsoundness of the three-component system, lime-silica-iron oxide, was determined for a molecular ratio of silica to lime of 1:2.60, free lime appearing above this ratio.

The raw mix of other series was changed by a substitution of 5% MgO in Series III. No effect of the reagent could be observed, showing that magnesia does not replace the lime in any of its compounds and remains as "free magnesia." Similarly free FeO was found to occur in clinker. The soundness limit in this case lies in the vicinity of a silica-lime ratio of 1:2.54. Unsoundness appears at 1:2.70.

It was thus established that a normally sintered or fused clinker has a maximum lime content expressed by the molecular ratio of SiO_2 to CaO as 1:2.65, the alumina being present as tricalcium-aluminate, iron oxide as dicalcium-ferrite, SO_3 and S as calcium sulfate or calcium sulfide. MgO and FeO are not taken into account here, as they exist in a free state.

When expressed as a formula the upper lime limit is:

$$\frac{1.07 \cdot CaO = (1.65Al_2O_3 + 0.7Fe_2O_3 + 0.7SO_3)}{SiO_2} = 2.65$$

The numerator denotes the total lime minus that required for the formation of aluminates, ferrites and calcium sulfates. To obtain the molecular ratio the quotient must be multiplied by $\frac{60.3}{56} = 1.07$.

The value of the above consists in indicating the proper composition of the raw mix. Assuming a clinker of the composition:

SiO_2	21.40%	CaO	54.10%
Al_2O_3	6.84%	MgO	2.20%
Fe_2O_3	3.48%	SO_3	1.67%

which has reached the soundness limit. By substituting the values in the formula, the limit appears for a silica-lime ratio of 1:2.46. Dividing this by the theoretical ratio $\frac{2.46}{2.65}$ we obtain 0.928, which is here called the *indicator,* and shows that for the given conditions the silica is able to combine with 92.8% of the theoretical maximum lime quantity. An ideal clinker would have an indicator 1.00. The strength of the clinker can be judged by an empirical formula:

Valuation number = (indicator)^3 × active components.

The active components here include bicalcium-silicate plus total CaO minus the lime of the aluminates, etc. In the case above it is: 21.40 + (64.10 — 14.94) = 70.56%. The valuation number (Wertigkeitszahl) is $(0.928)^3 \cdot 70.56 = 56.4$. — *Zement* (1927) **17,** 329-32, **18,** 353-56.

Mica-like Material from Clay. Argillaceous material is treated with water and the whole brought to boiling, at which point strong mineral acid is introduced to dissolve out the discoloring materials without decomposing the clay. The treated material is subjected to the action of fluorine gas or nascent hydrofluoric acid to precipitate the clay as a product which, after washing and drying, resembles mica. *English Patent No.* 272,976.

Analysis of Silicate Slag. T. P. Colclough discusses rapid control methods for blast furnace, open-hearth and electric furnace slags. The chief points in slag analysis are described with particular stress on the value of the volumetric determination of lime. *J. Soc. Glass Tech.* (1927), **11,** 177-84.

Coloring Cement or Concrete. Vat dyes in a dispersed or in an easily dispersed form are added to the gaging water to produce colored effects. Thioindigo red B gives pink, indanthrene blue or bromindigo 4B a blue, duranthene golden orange Y a yellow, and duranthene claret a bordeaux. *English Patent No.* 273,477.

Glaze for Fibrous Cement Products. Fibrous cement products, dried and degreased in a muffle furnace, are coated with an enamel-flux mixture which is vitrified at suitable temperature. A preferred formula for the flux is given as a fused mixture of silex, red lead, borax and potassium nitrate, disintegrated by pouring in cold water. *English Patent No.* 263,195.

Cement Mixture. Pulverized limestone, alumina, silica, ferric oxide are mixed in the proportion to make cement and coal dust added in such amounts that the carbon content is sufficient to combine with the CO_2 set free from the limestone during calcination. The mixture is pressed into blocks and calcined in a shaft or rotary kiln. The formation of CO is an indication that no more fuel is required; only sufficient air for the combustion of the carbon monoxide gas. *French Patent No.* 608,638.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Waterproof Face for Cement Block. Dry aggregate and portland cement are mixed together thoroughly and the mixture brought to a semi-wet state by addition of mixing water containing hardening and waterproofing chemicals. The wet mass is placed in a mold and the moisture from the main body of the block brought to the surface after which a layer of surface facing material and color is placed on the moisture surface to form a facing structure. *C. S. West, U. S. No.* 1,641,874.

Reinforced Plaster Board. A fabricated board comprising a body of plaster and facing sheets of fibrous material, and having reinforcing insets between the facing sheets at the side edges of the board, said insets each comprising a tubular structure having a plaster core. *A. S. Speer, U. S. No.* 1,641,-648.

Cellular Gypsum Products. A composition or heat insulating material of a cellular texture comprising the set product of a mixture comprising water, calcined gypsum as the major ingredient, a chemically reacting gas generating and bubble producing agent, and soap, the soap being used in such a quantity as to have no retarding effect on the hydration and setting of the gypsum.

In the preferred composition, calcined gypsum is the main ingredient, a water insoluble carbonate such as calcium carbonate, aluminum sulphate, water, a small quantity of gas emulsifying material such as soap, saponin or the like for conditioning the liquid mass for the production of the bubbles therein and for emulsifying the gas within the mass, and a small quantity of a suitable bubble sustaining or bubble maintaining colloidal substance of the hydrophobic or non-wetting variety, such as talc, silica, gum arabic, lamp black or carbon black or other equivalents are used. The solid materials may each be added specially to the mix or such of them may be made use of as happens to be present in the major ingredient as an impurity in its native state. Some of the materials may be either added to the mix in the form of a solution previously prepared, or may be added to the compound in a dry state, and then the compound added to the water or the water added to the compound, it being immaterial which course is followed. All the solid materials should be finely ground and when mixed with the water, the mixing or stirring should preferably be carried out with intermittent short intervals of rest and in one direction only, so as to make the loss of gas medium as little as possible and minimize the number of cells broken down.

A satisfactory formula for the production of a final cellular product, wherein the bubble producing medium consists of carbon dioxide gas evolved within the mass, weighing approximately 20 lb. per cu. ft., is as follows:

2 lb. calcined gypsum (substantially free of impurities)
3 oz. aluminum sulphate
1½ oz. calcium carbonate
4 gm. (60 gr.) soap, and
8 gm. (120 gr.) talc

The materials should be finely ground and thoroughly mixed and then introduced into or have added to them 26 liquid ounces of water. The mixture should be agitated or stirred in one certain direction, preferably with short intermittent periods of rest, for about one minute, and then poured into a mold and allowed to set.

For the production of a final cellular product, wherein the bubble producing medium consists of a gas evolved within the mass, weighing 13 to 14 lb. per cu. ft., the following formula is used:

2 lb. calcined gypsum (substantially free of impurities)
4 oz. aluminum sulphate
3 oz. calcium carbonate
6 gm. (90 gr.) soap
10 gm. (150 gr.) gum arabic, and
28 liquid oz. water,

the solid materials to be finely ground. The compounding of the materials is the same as in the preceding formula.

In case the major ingredient or any of the other ingredients are not of the average grade of purity, certain modifications will have to be made in the formulæ. The use of fresh calcined gypsum is contemplated in the above formulæ, and when the gypsum is well aged a lesser quantity of water than that specified will suffice.

None of the gas emulsifying and bubble maintaining agents are said to have any substantial retarding effects on the hydration and setting of gypsum, and also to present no undesirable interference with the natural process of the crystallization and setting.

The final product is claimed to be rigid, strong and durable; the air cells uniformly distributed and of uniform size throughout the structure; excess moisture present in the product after hydration and setting of the mass has taken place is said to evaporate from the mass quickly. The product may be precast at a factory in the form of partition tile, slabs, panels, sheets and the like, or the ingredients for the product may be supplied in dry form and transported to the place of use, where, merely by the addition of the proper amount of water, the product may be readily cast by any unskilled laborer in molds, forms, etc. The composition material is well adapted for various construction, heat and sound insulating, and fireproofing uses. *W. K. Nelson, U. S. Patent* No. 1,641,641 (*assignor to the Insulex Corp., Chicago, Ill.*)

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	.....	1.60	1.30	1.30	1.30
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Danbury, Conn.	2.25	2.25	2.00	1.75	1.50	.....
Dundas, Ont.	3.04	1.05	1.05	.90	.90	.90
Frederick, Md.	.75	1.35	1.25	1.15	1.05	1.05
Munns, N. Y.	1.00	1.40	1.40	1.25	1.15	1.00
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@1.60	1.40@1.60	.....
Prospect, N. Y.	1.00	1.50	1.40	1.30	1.30	.....
Rochester, N. Y.	1.50	1.50	1.50	1.50	1.50	1.50
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	**1.50**
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.50	.75	.....	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Buffalo and Linwood, Iowa	1.10	.....	1.45	1.25	1.30	1.30
Chasco, Ill.	1.00@1.30	.....	1.00@1.15	.....	1.00@1.15	.....
Columbia, Krause, Valmeyer, Ill.	1.10@1.50	1.10@1.25	1.20@1.35	1.10@1.35	1.10@1.35	‖1.25
Flux (Valmeyer)	1.10@1.50	.....	.....	1.75	.....	1.75
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
River Rouge, Mich.	1.20	1.20	1.20	1.20	1.20	1.20
Milltown, Ind.	.....	.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Mt. Vernon, Ill.	1.10@1.20	1.00	1.00	1.00	1.00	.....
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.....	.....	1.20	1.10	1.00	.....
St. Vincent de Paul, Que.	.70	1.35	1.00	.85	.80	1.25
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Ont.	1.55	2.05	2.05	1.90	1.90	1.90
Waukesha, Wis.	.90	.....	.....	.90	.90	.90
Wisconsin Points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Alderson, W. Va.	.50	1.40	1.35	1.25	1.20	1.15
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Brooksville, Fla.	.75	.....	2.65	2.65	2.40	2.00
Cartersville, Ga.	.....	1.50	1.50	1.35	1.05	.....
Chico and Bridgeport, Tex.	1.00	1.30	1.25	1.20	1.05	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.50	1.35	1.35	1.20	1.20	.....
Graystone, Ala.			Crusher run, screened, $1 per ton			
Kendrick and Santos, Fla.			3½ in. and less, $1 per ton			
Ladds, Ga.	.....	1.65	1.65	1.35	1.15	1.15
New Braunfels, Tex.	.60	1.25	1.10	.90	.90	.90
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.90	1.90	1.90	1.90	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis Co., Mo.	1.35	1.35	1.35	1.25	1.25	1.50
Sugar Creek, Mo.	1.15*	1.60†	1.60‡	1.60§	1.00¶	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90	2.00	1.75	1.55	1.25	1.25
Dwight, Calif.	1.00	1.00	1.00	.90	.90	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.00	1.55	1.25	1.15	.....
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.60	2.10	1.90	1.50	1.50	.....
Oakland and El Cerito, Calif.	1.00	1.00	1.00	.90	.90	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
San Diego, Calif.	.50@ .75	1.25@1.50	1.25@1.50	1.10@1.25	1.10@1.25	.....
Springfield, N. J.	1.70	2.20	2.10	1.70	1.60	1.60
Toronto, Ont.	.....	3.58@4.05	3.05@3.80	.....	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Columbia, S. C.	.....	.....	1.90	1.90	1.75	.....
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.			Crushed flint rock, 2.50 per cu. yd.			
Graystone, Ala.—Granite	.50	.....	.....	.....	.....	.....
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Rochester, N. Y.			Dolomite, all sizes, $1.50 per ton			
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.—Granite	.50	1.35	1.35	1.30	1.25	1.25

*¼ to ½ in. †¼ to 1 in. ‡¾ to 1¼ in. §¾ to 2¼ in. ¶Dust.
‖Rip rap per ton. (a) Sand. (b) to ⅜ in. (c) 1 in., 1.40. (d) 2in., 1.30. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (e) Agstone to June 15, 1927. [1] ¾ to ¼ in. [2] 1 to ¼ in. [3] 1½ to ¼ in. (A) Plus 4% sales tax, less 2% discount 30 days.

Agricultural Limestone

(Pulverized)

Alderson, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh	4.50
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh	5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50-mesh	1.50
Charleston, W. Va.—Marl, per ton, bulk	3.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Tex.—50% thru 50 mesh, 1.75; 50% thru 100 mesh	2.25
Cypress, Ill.—90% thru 100 mesh	1.35
Ft. Springs, W. Va.—50% thru 4 mesh	1.50
Hartford, Conn.—Paper bags, 4.25; cloth bags, 4.75; bulk	3.25
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.75; bulk	2.50
Ladds, Ga.—Analysis, $CaCO_3$, 64%; $MgCO_3$, 32%; pulverized; 50% thru 50 mesh	1.50@ 2.75
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk, 1.75; bags	3.75
Marl—Analysis, 90% $CaCO_3$; 10% $MgCO_3$; bulk, 2:25; bags	4.00
Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Middlebury, Vt.—Analysis, 90.05% $CaCO_3$; 90% thru 50 mesh	6.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 95%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Syracuse, N. Y.—Analysis 89% $CaCO_3$; $MgCO_3$, 4%; bags, 4.25; bulk	2.75
Toledo, Ohio—30% thru 50 mesh	2.25
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50
West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 50% thru 100 mesh; cloth bags, 4.75; paper, 4.25; bulk	3.25
Carload, 7.50; less than carload	9.00

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis, 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5%; $MgCO_3$; 90% thru 10 mesh	1.50

(Continued on next page)

Agricultural Limestone

Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh	3.50
Chicago, Ill. — 50% thru 100 mesh; 90% thru 4 mesh	.80
Columbia, Krause, Valmeyer, Ill. — Analysis, 90% $CaCO_3$; 100% thru 4 mesh	1.10@ 1.50
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	1.35
Danbury, Conn.—Analysis, 79% $CaCO_3$, 11% $MgCO_3$; 60% thru 100 mesh; 80% thru 50 mesh; 100% thru 4 mesh; bags, 4.25; bulk	3.25
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Kansas City, Mo. — 50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92¼ $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@ 2.35
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% $CaCO_3$, 54% $MgCO_3$; meal, 100% thru 4 mesh; 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh, bags	5.00
Pixley, Mo. — Analysis, 96% $CaCO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes	1.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.30

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—Analysis, 55% $CaCO_3$; 45% $MgCO_3$; 95% thru 100 mesh; bulk	3.50
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@ 3.50
Rocky Point, Va.—92% thru 100, mesh, bulk	2.25@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

*Bags extra.

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Buffalo, N. Y.	2.00@ 2.50
Cedarville and S. Vineland, N. J.—Damp	1.75
Dry	2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Gray Summit and Klondike, Mo.	1.75@ 2.00
Klondike, Mo.	2.00
Los Angeles, Calif.—Washed	5.00
Mendota, Va.	2.25@ 2.50
Michigan City, Ind.	.35
Mineral Ridge and Ohlton, Ohio	2.50
Oceanside, Calif.	3.00
Ohlton, Ohio	2.50
Pittsburgh, Penn.	3.00@ 4.00
Red Wing, Minn.	1.50
Ridgway, Penn.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.00
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.50
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Thayers, Penn.	2.50
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Columbus, Ohio		.15@ .30
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.65	.65			.65	
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.		1.00*		1.50*	1.75*	
Leeds Junction, Me.		.50	1.75		1.25	1.00c
Machias Jct., N. Y.	.75	.75	.85	.75	.75	.75
Montoursville, Penn.	1.00	.90	.85	.75	.75	.75
Northern New Jersey	.50	.50	1.00@1.25	1.00@1.25	1.00@1.25	
Portland, Me.		1.00	2.25		2.00	
Shining Point, Penn.			1.00	1.00	1.00	1.00
Somerset, Penn.		2.00				
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Aurora, Yorkville, Sheridan, Oregon, Moronts, Ill.	.50	.40	.20	.45	.60	.55
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Appleton and Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Attica, Ind.			All sizes .75@.85			
Barton, Wis.		.50	.75	.75	.75	.75
Chicago district, Ill.	.70	.55	.55	.60	.60	.60
Columbus, Ohio		.75	.75	.75	.75	
Des Moines, Iowa		.30	1.30	1.30	1.30	1.30
Eau Claire, Wis.	.40	.40	.65	.90	.90	
Elkhart Lake, Wis.	.60	.40	.50	.56	.50	.45
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.		.50		.80	.80	.70
Hamilton, Ohio		1.00			1.00	
Hersey, Mich.		.50		.70		.70
Humboldt, Iowa	.50	.50	1.50	1.50	1.50	1.50
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Joliet, Plainfield and Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50@ .60	.50@ .60	1.30	1.30	1.20	1.20
Mankato, Minn.				1.25	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.40@ .50	.40@ .50	1.40	1.35	1.25	
Pittsburgh, Penn.	1.25	1.25	.85	.85	.85	.85
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	1.20	1.45	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	1.25	1.25		1.25
Terre Haute, Ind.	.75	.60	.90	.80	.75	.75
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.15	1.10
Zanesville, Ohio		.60	.50	.60	.80	
SOUTHERN:						
Charleston, W. Va.	1.40	1.40	1.40	1.40	1.40	1.40
Brewster, Fla.	.45	.45	2.25			
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Chattahoochie River, Fla.		.70		1.75		
Eustis, Fla.		.50@ .60				
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.00
Macon, Ga.		.50			.85	
New Martinsville, W. Va.	1.00	.90@1.00		1.20@1.30		.80@ .90
Roseland, La.	.25	.20	1.00	1.25	.60	.60
WESTERN:						
Kansas City, Mo.		.70@ .75				
Los Angeles, Calif.	.40	.40	.25@1.00	.25@1.00	.25@1.00	.25@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Phoenix, Ariz.	1.25	1.00	2.00	1.50	1.75	1.00
Pueblo, Colo.	.80	.60		1.20		1.15
San Diego, Calif.		.40@ .50	.80@1.00	.80@1.00	.65@ .80	.65@ .80
Seattle, Wash. (bunkers)	1.25	1.25	1.25	1.25	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.50
Burnside, Conn.	.75					
Des Moines, Iowa	.50					
Dresden, Ohio	.50	.50	.60@ .80	.65	.60	.60
East Hartford, Conn.	.80*d					
Gainesville, Texas					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					.68	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Lindsay, Texas		1.10			.55	
Macon, Ga.	.35					
Mankato, Minn.	.30					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Ottawa, Oregon, Moronts and Yorkville, Ill.			Ave. .60 per ton all sizes			
Roseland, La.					.50	
Somerset, Penn.		1.85@2.00		1.50@1.75		
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	2.00	2.00	2.25	1.50		3.75	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75	1.75		1.75	1.75@2.00		
Buffalo, N. Y.	1.50	1.50		2.00@2.50			
Columbus, Ohio	1.50@2.00	1.25@1.50	2.00	.30	1.75@2.00	2.75@4.50	
Dresden, Ohio	1.25@1.50	1.25@1.50	1.50	1.00	1.25		
Eau Claire & Chippewa Falls, Wis.						3.00	
Elco, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75	1.75		
Kasota, Minn.							1.00
Klondike, Mo.				2.00	2.00		2.00
Massillon, O. (a)	2.00@2.25				2.00@3.00		
Mendota, Va.	Ground flint or silex—16.00@20.00 per ton						
Michigan City, Ind.				.30@ .35			
Millville, N. J.				1.75b		3.50	
Montoursville, Penn.				1.35@1.60			
New Lexington, O.	2.00	1.25					
Ohlton, Ohio	1.75b	1.75b		2.00b	1.75b	1.75b	
Red Wing, Minn.(d)					1.50	3.00	1.50
Ridgway, Penn.	1.50	1.50	1.75@2.00c				
Round Top, Md.				1.60		2.25	
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.	Potters' flint per ton, 9.00@10.00						
Thayers, Penn.	1.25	1.25		2.00			
Utica, Ill.	.50	.60		.65	.75		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	1.75*@2.00	1.75*@2.00	*1.50	1.75*@2.00	1.75*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.50		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (b) Damp. (c) Shipped from Albany. (g) Dry. (a) Green, 1.50@1.75. (d) Filter sand, 3.00.

Crushed Slag

City or shipping point	Roofing	¼ in. down	⅜ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.25			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*		1.45*	
Jackson, Ohio	1.75*	1.05*	1.55*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.25	1.25	1.25	1.25	1.25	1.25
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*		
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95[4]
Chazy, N. Y.		8.50	7.50	10.00		15.50[21]	8.50	14.00
Lime Ridge, Penn.					5.00[2]			
Pittsburgh, Penn.	12.50	8.50	8.50		9.00	11.00	8.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.			10.00				6.00	
York, Penn.		9.50	9.50	10.50	8.50	10.50	8.50	1.65[7]
CENTRAL:								
Afton, Mich.							8.40	1.35
Carey, Ohio	12.50	8.50	8.50		9.00		8.50	
Cold Springs, Ohio		8.50	8.50				8.00	
Cold Springs and Gibsonburg, Ohio	12.50	8.50	8.50		9.00	11.00		
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio	12.50							
Milltown, Ind.		8.50@10.00		10.00[8]			8.50[22]	1.35[10]
Scioto & Marble Cliff, O.		8.50	8.50	9.50	8.25	.62½	7.50	1.50[3]
Sheboygan, Wis.	11.50						9.50	.95
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	12.50	8.50	8.50		9.00		9.00	1.50[3]
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Texas							7.00	
Frederick, Md.		9.50	9.00	9.50		9.00	7.00	
Graystone, Ala.	12.50	9.00		12.50		1.25[1]	8.00	1.35
Keystone, Ala.	12.50	10.00	9.00	11.00			8.00	1.50
Knoxville, Tenn.	20.25	9.00	9.00	9.00			8.00	1.35
New Braunfels, Tex.	18.00	12.00	10.00	12.00	10.00		9.50	
Ocala, Fla.		11.50	9.00			1.40[5]	11.00	
Saginaw, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
WESTERN:								
Kirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Los Angeles, Calif.	19.00	19.00	14.00		16.20		12.50	2.50
Dittlinger, Tex.		12.00@13.00					9.50[8]	1.50[23]
San Francisco, Calif.	20.00	20.00	13.50	21.00			14.50[30]	2.15
Tehachapi, Calif.	12.80						12.80	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] 180 lb. [6] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] 180-lb. net barrel, 1.65; 280-lb. net barrel, 2.65. [8] To 11.00. [10] To 1.50. [12] To 3.00. [22] To 9.00. [23] To 1.60. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50
Franklin, Penn.		1.75
Michigan City, Ind.		.30
Mineral Ridge, Ohio	*1.75	*1.75
Montoursville, Penn.		1.10
Ohlton, Ohio	a1.75@a2.00	a1.75
Red Wing, Minn.		1.00
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50	3.50
Thayers, Penn.		2.25
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Wet. (a) Green.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel worker's crayons	.08
Per gross	1.00@ 1.50
Chatsworth, Ga.:	
Crude talc, grinding	5.00
Ground talc (150-200 mesh)	10.00
Pencils and steel worker's crayons, per gross	1.00@ 2.00
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	9.50@10.50
Same, burlap bags, bags extra	8.50@ 9.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc (for grinding)	5.00
Ground talc (150-200 mesh), bags	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Glenden, N. C.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (150-200 mesh), bags	8.00@12.00
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	2.75@ 4.00
Ground talc (150-200 mesh), bags	9.00@14.50
Joliet, Ill.:	
Off color talc, bags	12.50
California talc, bags	30.00
Southern talc, bags	20.00
Pencils and steel worker's crayons, per gross	2.50
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (125-200 mesh), bags	10.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock	
Columbia, Tenn.—B.P.L. 65-70%	3.50@ 4.50
Gordonsburg, Tenn.—B.P.L. 65-70%	3.75@ 4.25
Mt. Pleasant, Tenn.—B.P.L. 72%	5.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00
Ground Rock (2000 lb.)	
Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	360.00
Clean shop scrap	25.00
Mine scrap	22.00
Roofing mica	30.00
Punch mica, per lb.	.12
Cut mica—50% from Standard List.	

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars	.....	10.50
Brandon, Vt. — English pink, English cream and coral pink	*12.50	*12.50
Brandon grey	*12.50	*12.50
Brighton, Tenn.— All colors and sizes	.....	§5.00
Buckingham, Que.—Buff stucco dash	.....	12.00@14.00
Chicago, Ill. — Stucco chips, in sacks, f.o.b. quarries	.....	17.50
Crown Point, N. Y.— Mica spar	.....	9.00@10.00
Dayton, Ohio	.....	6.00@24.00
Easton, Penn.— Green stucco	.....	12.00@18.00
Green granite	.....	14.00@20.00
Haddam, Conn.—Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash	.....	8.00@24.00
Middlebrook, Mo.—Red	.....	20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	.....	5.50@ 7.50
Milwaukee, Wis.	.....	14.00@34.00
New York, N. Y.—Red and yellow Verona	.....	32.00
Phillipsburg, N. J.— Royal green granite	.....	12.00@16.00
Randville, Mich.— Crystalite crushed white marble, bulk	5.00@ 7.50	4.50@ 7.50
Rose pink granite, bulk	.....	12.00
Stockton, Calif.—"Natrock" roofing grits	.....	12.00@18.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	.....
Wauwatosa, Wis.	.....	20.00@25.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 17.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Bristol, Tenn.—Color, white; analysis, K_2O, 6 to 10%; Na_2O, 2½ to 4%; SiO_2, 68 to 78%; Fe_2O_3, 12 to 20%; Al_2O_3, 16.5 to 18.5%; 99% thru 200 mesh; bulk, depending on grade	14.50@18.00
Brunswick, Me.—Color, white; 98% thru 140 mesh, bulk	19.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% thru 60 mesh, bags	16.00
96% thru 150 mesh, bags	28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 10.20%; crude	10.05
Pulverized, 95% thru 200 mesh; bags, 22.00; bulk	20.00
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; Si_2O, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh	18.00
Crude	9.00
Tenn. Mills—Color, white; analysis K_2O, 18%; Na_2O_3, 10%; 68% SiO_2; 99% thru 200 mesh; bulk	18.00
99% thru 140 mesh, bulk	16.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich.(Limestone), per ton	1.75
Belfast and Rockland, Me.—(Limestone), bags, per ton	10.00
Cartersville, Ga.—(Limestone), per bag	2.00
Centerville, Iowa—(Gypsum), per ton	18.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.—(Limestone), bulk	6.00@ 7.00
Easton, Penn.—Per ton, bulk	3.00
Joliet, Ill.—(Limestone), bags, per ton	4.50
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton	15.00
Gypsum, Ohio—(Gypsum), per ton	10.00
Hartford, Conn.	‡7.50@*9.00
Limestone, Wash. — (Limestone), per ton	12.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	10.00
Warren, N. H.—(Mica), per ton	3.85@ 3.90
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.—(Limestone), bulk	‡7.50@*9.00
Wisconsin Points—(Limestone), per ton	9.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	12.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	16.00
Farmington, Conn.	13.00
Flint, Mich.	¶12.00@17.50*
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00@19.00*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis and St. Paul, Minn.	10.00
Minnesota Transfer	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	16.00@17.00
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75*
Saginaw, Mich.	13.50
San Antonio, Texas	16.00
Sebewaing, Mich.	12.00
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	18.00@20.00
Toronto, Canada	16.00*†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	14.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M., 10 days.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.84¼	3.37
Atlanta, Ga.	.....	2.35
Baltimore, Md.	.....	2.15
Birmingham, Ala.	.....	2.30
Boston, Mass.	.53¼	2.13
Buffalo, N. Y.	.55	2.20
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	.....	2.24
Charleston, S. C.	.....	2.35
Cheyenne, Wyo.	.82¾	3.31
Cincinnati, Ohio	.58	2.32
Cleveland, Ohio	.....	2.24
Chicago, Ill.	.51¼	2.05
Columbus, Ohio	.57¼	2.29
Concrete, Wash.	.....	2.35
Dallas, Texas	.....	2.00
Davenport, Calif.	.....	2.45*
Davenport, Iowa	.....	2.24
Dayton, Ohio	.58¼	2.33
Denver, Colo.	.66¼	2.65
Des Moines, Iowa	.....	2.05
Detroit, Mich.	.....	2.00
Duluth, Minn.	.....	2.04
Houston, Texas	.....	2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.	.....	2.30
Jacksonville, Fla.	.....	2.20
Jersey City, N. J.	.....	2.03
Kansas City, Mo.	.....	1.92
Los Angeles, Calif.	.57½	2.50
Louisville, Ky.	.55½	2.22
Memphis, Tenn.	.....	2.30
Milwaukee, Wis.	.....	2.00@2.20
Minneapolis, Minn.	.....	2.12@2.22
Montreal, Que.	.....	1 36
New Orleans, La.	.....	2.30
New York, N. Y.	.....	1.93
Norfolk, Va.	.....	2.07
Oklahoma City, Okla.	.....	2.46
Omaha, Neb.	.....	2.36
Peoria, Ill.	.....	2.22
Philadelphia, Penn.	.....	2.11
Phoenix, Ariz.	.76½	3.06
Pittsburgh, Penn.	.....	2.04
Portland, Colo.	.....	2.80
Portland, Ore.	.....	2.60
Reno, Nev.	.....	2.91
Richmond, Va.	.....	2.24
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.	.....	2.21
Savannah, Ga.	.....	2.50
St. Louis, Mo.	.51¼	2.05
St. Paul, Minn.	.....	2.12@2.22
Seattle, Wash.	.....	2.50†
Tampa, Fla.	.....	2.25
Toledo, Ohio	.....	2.20
Topeka, Kan.	.....	2.41
Tulsa, Okla.	.....	2.33
Wheeling, W. Va.	.....	2.12
Winston-Salem, N. C.	.....	2.59

NOTE—Add 40c per bbl. for bags.
*Includes sacks.
†10% discount, 10 days.

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Buffington, Ind.	.....	1.80
Chattanooga, Tenn.	.....	2.45*
Concrete, Wash.	.....	2.35
Davenport, Calif.	.....	2.35
Detroit, Mich.	.....	2.15
Hannibal, Mo.	.....	1.90
Hudson, N. Y.	.....	1.65
Leeds, Ala.	.....	1.85
Mildred, Kan.	.....	2.35
Nazareth, Penn.	.....	2.15
Northampton, Penn.	.....	1.75
Richard City, Tenn.	.....	2.05
Steelton, Minn.	.....	1.85
Toledo, Ohio	.....	2.20
Universal, Penn.	.....	1.80

*Including sacks at 10c each.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	8.00	.....	9.00	.....	.....	.14½	.15½	30.00
Douglas, Ariz.	.....	.....	6.00	.....	.....	.....	15.00	.....	40.00	13.50	35.00	45.00	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio	3.00	4.00	6.00	8.00	9.00	9.00	19.00	7.00	27.50	19.00	.....	15.00	30.00
Los Angeles, Calif.	.....	.....	7.50@9.50	11.50y	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	11.65m	13.40r	14.40r	.....	15.40r	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.00	10.00	10.00	13.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
(m) Includes paper bags; (o) includes jute sacks; (r) including sacks at 15c; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	17.00c@19.00a	.....	.....
Detroit, Mich.	.16	.....	.18
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	15.00@16.00a	.....	.....
Graettinger, Iowa	.18@ .20	.....	.....
Indianapolis, Ind	.13@ .15†	.....	.....
Los Angeles, Calif.¶	5¾x3½x12—55.00	7¾x3½x12—65.00	
Oak Park, Ill.	20.00	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.20@ .25	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red, Yellow, Gray, and Orange	Green, Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35
*End bands	.25	.35
*Eave closers	.06	.08
*Ridge closers	.05	.06

*Used only with Spanish tile.
†Price per square.

Houston, Texas—Roofing Tile, per sq. 25.00

Indianapolis, Ind.—9x15-in. Per sq.

Gray	10.00
Red	11.00
Green	13.00

Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich.:	Per 100
5x8x12	5.00
Grand Rapids, Mich.:	
5x8x12	8.00
5x4x12	4.50
Longview, Wash.: (Stone-Tile)	Per 1000
4x6x12	55.00
4x8x12	64.00
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Grand Rapids, Mich.:	Per 100
5x8x12	7.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa—5 to 36 in., per ton	8.00
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per ft.:	
3 in.	.04
4 in.	.05½
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	18.00@50.00
Mt. Pleasant, N. Y.	.....	14.00@23.00
Oak Park, Ill.	.....	42.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.50@ 25.00
Rapid City, S. D.	18.00	25.00@40.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted.

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Graettinger, Iowa	.04½d	.05½	.08½	.12½	.17½	.....	.40	.50	.60	.70	.....	.....	.....	.....	.....	.....	.....
Grand Rapids, Mich. (b)																	
Culvert pipe	.....	.....	.....	.60	.72	1.00	1.28	1.60†	.....	1.92	2.32	3.00	4.00	5.00	6.00	.....	.....
Sewer pipe (d)	.....	.....	.....	.....	.....	.63	.....	.60†	.....	.....	.....	.58	.....	.....	.....	.....	.....
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.								Sewer pipe 40% off list; culvert—list									
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.								6 in. to 24 in., $18.00 per ton									
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.								12.00 per ton									
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tacoma, Wash.	.15	.18	.25	.38	.45	.60	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tiskilwa, Ill. (rein.) (a)	.....	.....	.....	.65	.75	.85	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Yakima, Wash.								$10.00 per ton									

(a) 24-in. lengths; (b) Reinforced; (d) Eastern clay, list, 72% and 60% off.
†21-in. diam. ‡Price per 2-ft. length.

Cement Price Cut in Detroit

A REDUCTION of 15 cents a barrel in the price of portland cement at Detroit is announced by the Universal Portland Cement Co., effective September 23. The new price of $2 per barrel is net without bags in carload lots. The Huron Portland Cement Co. has also made a reduction of 15 cents a barrel at Detroit, according to local press. No reason was advanced for the change in price.

Demand for Cement Products Constant in the East

THE recent survey, of building conditions in Pennsylvania and other eastern Atlantic states, by the Portland Cement Association indicates that the demand for concrete building units is holding up well. This survey was made to determine the present volume of building, as compared to that of former years, and its relation to the volume of business being done by the manufacturers of concrete building units.

The report continues:

"The territory embraced by the survey was a section along the seaboard representing an important field of building construction in the east, running from and including Maryland north through Delaware, eastern Pennsylvania, New Jersey, New York and the New England states. The survey developed their two outstanding features:

"A reduction in building volume is by no means general.

"In many areas better building business is anticipated for the last half of this year than was experienced in the first half.

"These areas, it is true, are of somewhat smaller extent than those where business was not up to last year's mark, but even in those sections having a reduced volume there was apparently no indication of a let-up of construction such as some persons have predicted.

"In all sections the demand for concrete building units—block, brick and tile—is holding up well, with every indication that production this year will be very close to last year's record volume in spite of whatever decline there has been in the construction industry."

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	Aug. 27	Sept. 3	Aug. 27	Sept. 3
Eastern	4,639	4,872	17,760	17,479
Allegheny	4,007	4,315	12,622	12,514
Pocahontas	746	681	1,430	1,323
Southern	738	758	14,347	14,352
Northwestern	1,437	1,597	11,120	11,028
Central Western	537	531	12,873	12,154
Southwestern	522	504	7,714	6,886
Total	12,626	13,258	77,866	75,736

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1926 AND 1927

	Limestone Flux		Sand, Gravel and Stone	
	1926	1927	1926	1927
	Period to Date		Period to Date	
District	Sept. 4	Sept. 3	Sept. 4	Sept. 3
Eastern	117,472	119,671	332,777	333,755
Allegheny	134,493	126,166	248,600	251,340
Pocahontas	17,936	17,900	29,986	30,532
Southern	23,710	20,287	423,842	425,051
Northwestern	49,776	48,187	216,172	218,321
Central Western	17,523	17,842	315,137	316,249
Southwestern	10,084	11,664	181,162	184,291
Total	370,994	361,717	1,747,676	1,759,539

COMPARATIVE TOTAL LOADINGS 1926 AND 1927

	1926	1927
Limestone flux	*370,994*	*361,717*
Sand, stone, gravel	*1,747,676*	*1,759,539*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning September 25:

TRUNK LINE ASSOCIATION DOCKET

16292. **Sand or gravel,** carloads, minimum weight 90% of marked capacity of car, from Carpenterville, N. J., to Blairstown, N. J., $1.15 per ton of 2000 lb., subject to Rule 77. Reason—To establish rate which will be comparable with those in force on like commodities between points in the same general territory.

16298. **Sand, other than blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads, minimum weight 90% of marked capacity of car, to New Brunswick, N. J., from Morrisville, Penn., 80c, and from Jersey City, N. J., 81c per 100 lb., the rate from Jersey City to apply only on sand. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory, per P. R. R. G. O. I. C. C. 14628.

16310. **Crushed stone,** carloads, minimum weight 90% of marked capacity of car:

	From York, Penn.	From Campbell, Penn.	From Spring Grove, Penn.
To			
Springvale, Penn.	100	100	.....
Felton, Penn.	100	105	105
Brogueville, Penn.	100	105	105
Fenmore, Penn.	120	120	120
Laurel, Penn.	120	120	120
High Rock, Penn.	120	120	120
Bruce, Penn.	120	120	120
Bridgeton, Penn.	120	120	120
Woodbine, Penn.	120	120	120
South Side, Penn.	120	120	120
Castle Fin, Penn.	120	120	120
Bryandsville, Penn.	120	120	120
Delta, Penn.	120	120	120
Cardiff, Md.	120	120	120
Whitford, Md.	120	120	120
Pylesville, Md.	120	120	120
Street, Md.	120	120	120
Minefield, Md.	120	120	120
Rocks, Md.	120	120	120
Fern Cliff, Md.	120	120	120
Sharon, Md.	120	120	120
Forest Hill, Md.	120	120	120
Bynum, Md.	120	120	120
Belair, Md.	120	120	135
Vale, Md.	120	120	135
Fallston, Md.	120	135	135
Laurel Brook, Md.	120	135	135
Baldwin, Md.	120	135	135
Hyde, Md.	....	135	135
Long Green, Md.	....	135	.....
Glenarm, Md.	....	135	.....

The above rates in cents per 2000 lb.

Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory as per P. R. R. G. O. I. C. C. Nos. 13641 and 13963.

16319. **Sand, engine, glass and molding** and ground flint, carloads, minimum weight 90% of marked capacity of car, from Berkeley Springs, Great Cacapon and Hancock, W. Va., to Chester, Penn., for Reading Co. delivery and intermediate points between Chester and Philadelphia, Penn., $2.52 per ton of 2000 lb. Reason—Proposed rate is comparable with rate now applicable to Philadelphia, Penn., for Reading Co. delivery as well as to Camden, N. J., for A. C. R. R. delivery and the same is proposed to Chester, Penn.

16320. **Crushed stone,** other than bituminous asphalt rock, N. O. I. B. N., carloads, minimum weight 90% of marked capacity of car, from South Amsterdam, N. Y., to Yosts, N. Y., 75c per ton of 2000 lb. Reason—Proposed rate is comparable with rate to Fonda, Crescent and Dunsbach Ferry, N. Y., as per N. Y. C., I. C. C. N. Y. C. No. 15402.

16322. **Silica sand,** carloads, minimum weight 90% of marked capacity of car from Glyndon and Glen Morris, Md., to Jersey City, N. J., $3 per ton of 2000 lb. Reason—Proposed rate is comparable with rate on ground flint from and to same points as per Western Maryland Ry., I.C.C. 7414.

16326. (A) **Sand** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads. (B) **Sand, blast, engine, foundry molding, glass, silica, quartz or silex,** carloads, minimum weight 90% of marked capacity of car, from Lewes, Del., to Alexandria, Va.; (A) $2.40, and (B) $2.60 per ton of 2000 lb. (subject to Rule 77). Reason—To establish the same rates as at present in force to Washington, D. C., as per P. R. R., G. O.-I. C. C. 14212.

16332. **Crushed stone,** carloads, minimum weight 90% of marked capacity of car, from Howellville, Penn., to Farnhurst, Del., 85c per ton of 2000 lb. (subject to Rule 77). Reason—Proposed rate is comparable with rates now in effect from Port Deposit, Md., Oldham, Tacony, Shackamaxon St. and Ontario St., Penn., as per P. R. R., G. O.-I. C. C. Nos. 13960, 13940 and 14153.

16333. **Stone,** natural (other than bituminous asphalt rock), **crushed,** N. O. I. B. N., carloads, minimum weight 90% of marked capacity of car, from Jordanville, N. Y., to N. Y. C. and W. S. R. R. points Albany, Little Falls, Syracuse, Fulton, Richland, Watertown, Marcy, South Bethlehem, South Fort Plain, Utica, Kirkville, Poland, N. Y., and various rates ranging from 95c to $1.50 per ton of 2000 lb. Reason—Proposed rates are fairly comparable with rates now in force from Little Falls, N. Y., as per N. Y. C. R. R., I. C. C. N. Y. C. No. 15402, and are also comparable with rates published by S. N. Y. Ry. to D. & H. Co. as per S. N. Y. I. C. C. No. 7, and by the D. L. & W. R. R. to points common with the N. Y. C. R. R. as per D. L. & W. R. R. P. S. C. N. Y. No. 4624.

16337. **Crushed stone,** trap rock, mine rock, broken stone and **stone screenings,** carloads, minimum weight 90% of marked capacity of car, from Jamesville, N. Y., to P. R. R. points Severance, Garbutt, Halite, Black Creek, Olean, Holland, Ischua, N. Y., and various rates ranging from $2.05 to $2.65. Reason—Proposed rates compare favorably with rates now published from Le Roy and Buffalo, N. Y., to points in the same territory.

16341. **Crushed stone,** carloads, minimum weight 90% of marked capacity of car, from York, Penn., to Brandywine to Hughesville, Md., inclusive, $1.95 per ton of 2000 lb. (subject to Rule 77). Reason—To establish rate which will be comparable with rate in force from Ashland and Blue Mont, Md., to Mechanicsville to Forest Hall, Md., inclusive, as per P. R. R. G. O. I. I. C. C. 14541.

16342. **Crushed stone** and crushed stone coated with oil, tar and asphaltum, carloads, minimum weight 90% of marked capacity of car, from White Haven, Penn., to Audenried, Oneida Junction and McAdoo, Penn., 90c per ton of 2000 lb. (subject to Rule 77). Reason—Proposed rate is comparable with rate now in effect from White Haven to Audenried, Penn., as per C. N. J. I. C. C. G3295 and to Mahoning and Quakake, Penn., L. V. R. R.

16345. **Sand,** other than blast, engine, glass, molding, foundry, silex or quartz, **and gravel,** carloads, minimum weight 90% of marked capacity of car, from Falls Creek, Penn., to stations on the Lake Erie, Franklin and Clarion R. R., Summerville to Clarion, Penn., inclusive, $1.25 per ton of 2000 lb. Reason—Proposed rate compares favorably with rate from Falls Creek, Penn., to Shippenville, McLaughlin Spur and Limestone, Penn.

16376. **Crushed stone,** trap rock, mine rock, broken stone and stone screenings, in bulk, carloads, minimum weight 90% of marked capacity of car, to Oquago and Gulf Summit, N. Y., from Jamesville and Sherburne, N. Y., $1.50, and from Whitneys Point, N. Y., $1.35 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities from Jamesville to Binghamton, N. Y., Langdon, N. Y., Owego, N. Y., and Tioga Center, N. Y.

16382. **Stone, crushed,** carloads, minimum weight 90% of marked capacity of car, from Peddicord Siding and Leonard Siding (Baltimore), Md., to Washington, D. C., $1.20 per ton of 2000 lb. Reason—To establish a rate which will be comparable with rate now in effect via the P. R. R. locally.

16389. **Gravel and sand,** N. O. I. B. N., in Official Classification, except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads, minimum weight 90% of marked capacity of car, to Oquaga, N.Y., and Gulf Summit, N.Y., from Sherburne, N. Y., $1.50, and from Whitneys Point, N. Y., $1.35 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in effect on like commodities for similar distances, conditions and services.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

13038. **Common building sand,** carloads, minimum weight 60,000 lb., from East Swanton, Vt., to Winooski, Vt., 70c per net ton. Reason—Comparable with rate published by the Boston & Maine R. R. for like distance.

13054. **Stone, broken or crushed,** carloads, minimum weight 90% of marked capacity of car, from Branford (Pine Orchard Quarry), Conn., to Fitchburg, Mass., $1.25 per net ton. Reason—To enable shippers to meet competition.

CENTRAL FREIGHT ASSOCIATION DOCKET

16545. To establish 60% of sixth class on **agricultural limestone,** carloads, Putnamville, Ind., to

Central Freight Association territory. Present rate, classification basis except where commodity rates are in effect.

16552. To establish on **sand and gravel**, carloads, Brevoorts, Ind., to Ledford, Ill., rate of 88c per net ton. Present rate, 15c.

16558. To establish the following rates on slag, also **crushed stone, agricultural limestone and sand**, carloads, points in the Chicago district to stations on the Grand Trunk Ry. in Indiana. Present and proposed rates: On crushed stone, in bulk, in open top cars only; gravel, limestone, agricultural (not ground or pulverized), in bulk, in open top cars only; sand, etc.

To	Proposed	Present
Haskells, Ind.	(1) 95	95
Union Mills, Ind.	(2) 95	95
Wellsboro, Ind.	(2) 95	95
Kingsbury, Ind.	(2) 100	100
Stillwell, Ind.	(3) 101	101
Mill Creek, Ind.	(3) 101	101
Crumstown, Ind.	(3) 101	101
South Bend, Ind.	(3) 101	101
Mishawaka, Ind.	(3) 101	101

(1) Rate on crushed stone and agricultural limestone (not ground or pulverized), in bulk, in open top cars only, 85c per net ton of 2000 lb.

(2) Rate on crushed stone and agricultural limestone (not ground or pulverized), in bulk, in open top cars only, 90c per ton of 2000 lb.

(3) Rate on crushed stone and agricultural limestone (not ground or pulverized), in bulk, in open top cars only, 95c per ton of 2000 lb.

16563. To establish on **crushed stone**, carloads, Spore, Ohio, rate of 135c to Carbondale and Mineral, Ohio, and 80c per net ton to Pavonia, Ohio. Present rate, sixth class.

SOUTHERN FREIGHT ASSOCIATION DOCKET

36018. **Sand and gravel**, from Montgomery, Ala., etc., to Maury, Ala. It is proposed to establish an intrastate rate of 79c per net ton on **sand and gravel**, carloads, from Montgomery, Coosada, Oktamulke, Prattville Junction and Jackson's Lake, Ala., to Maury, Ala., same as rate in effect to McAdory, Ala. (See Note A.)

36057. **Crushed, ground or pulverized marble, stone**, slate, whitestone, etc., from southeastern points (named below) to Pomeroy, Ohio. It is proposed to establish rates on the commodities mentioned to Pomeroy, Ohio, from Tate, Whitestone and Mineral Bluff, Ga., Kinsey, N. C., Cartersville, Bolivar and Fairmount, Ga., Marmor, Tellico Plains and Knoxville, Tenn., Brownson and Gantt's Quarry, Ala., the same as applicable from these origins to Coshocton, Mansfield, Ashland and Massillon, Ohio.

36072. **Crushed stone**, from Klotz and Longcor, Va., to Inlet and Ocean Park, Va. It is proposed to establish reduced rate of 165c per net ton on **stone, crushed**, carloads, minimum weight 100,000 lb. (except as indicated in Note A) from the origins mentioned to Inlet and Ocean Park, Va., same as rate suggested to these destinations from Rocky Point, Indian Rock and Eagle Mountain, Va., under Submittal 35618.

36214. **Crushed stone** from Whitestone, Ga., to Corpus Christi, Tex. In lieu of combination rate, it is proposed to establish through rate of 725c per net ton on crushed stone, carloads, from Whitestone, Ga., to Corpus Christi, Tex., for application via New Orleans, La., this being the combination rate now available via Vicksburg, Miss.-Shreveport, La., route.

WESTERN TRUNK LINE DOCKET

2051-C-C—Rate: **Crushed stone**, carloads. (See Note A.) But in no case shall the minimum weight be less than 50,000 lb., from Quartzite, Minn., to Elgin, Neb. Present, class rate; proposed, 11½c per 100 lb.

365-A—Rates: **Sand and gravel**, carloads, usual minimum, from Mason City, Iowa, to stations in Minnesota on C. M. & St. P. Ry. Present, as shown in tariffs; proposed, to authorize the same scale on rates as was recently authorized from Prairie du Chien, Wis., to Minnesota destination (W. T. L. Rate Advice No. 8044). To illustrate:

Miles	Pres.	Prop.	Miles	Pres.	Prop.
25	80	75	80	130	110
30	80	80	90	130	120
35	80	85	100	130	120
40	100	85	125	140	140
50	100	90	150	140	150
60	110	95	165	140	160
65	110	100	175	160	160
70	110	105	200	160	170
75	110	110			

ILLINOIS FREIGHT ASSOCIATION DOCKET

1257C. To include "**gravel**" in the present description applying on sand as provided for in Items No. 1400 and 1405 of B. T. Jones' Freight Tariff 108L, which read as follows:

(Item 1400 applying from Chicago, Ill.) Sand, carloads, minimum weight capacity of car.

(Item 1405 applying from Ottawa, Ill.) Sand, carloads, minimum weight capacity of car, but not less than 40,000 lb.

—to Mississippi valley points.

1526. **Sand, gravel and crushed stone**, carloads, minimum weight marked capacity of car, from Brookport, Cairo, Metropolis and Shetlerville, Ill., to Laclede, Kinmundy and Tonti, Ill. Present—Mileage rate from Brookport, Cairo and Metropolis on sand and gravel, class rates from Shetlerville, on crushed stone. Proposed—$1.26 per ton of 2000 lb.

SOUTHWESTERN FREIGHT BUREAU DOCKET

13234. **Crushed stone**, from points in Missouri and Kansas to Strauss, Kan. Establish a rate of 4c per 100 lb. on stone, crushed, broken or ground, carloads, minimum weight marked capacity of car, but not less than 60,000 lb., except when car is loaded to full visible or space-carrying capacity, in which case actual weight will govern, from Carthage, Joplin and Webb City, Mo., also Galena, Kan., to Strauss, Kan. In most instances crushed stone and chatts, carloads, are on the same basis; it is therefore desired to establish on crushed stone, carloads, from Carthage, Joplin, Mo., etc., to Strauss, Kan., a rate of 4c per 100 lb., which is the present rate applicable on chatts, carloads.

TRANSCONTINENTAL FREIGHT BUREAU DOCKET

8185. **Silica sand**, N. O. S., natural or ground, carloads, W. B.: Request for rate of 40c per 100 lb. on silica sand N. O. S., natural or ground, carloads, minimum weight 80,000 lb., from Group "D" to California points under Tariff 1B (I.C.C. Nos. 68, A184, 1902 and 1184 of Frank Van Ummerson, H. Wilson, B. T. Jones and H. C. Toll, agents, respectively).

Note A.—Minimum weight 90% of marked capacity of car, except that when car is loaded to cubicai or visible capacity the actual weight will apply.

Recent I. C. C. Decisions

19188. Sand rates from Keithley Spur, Neb., to Minneapolis, Minn., applicable. Recommended dismissed.

19080. A finding of unreasonableness and an award of reparation have been recommended as to the rates charged on shipments of sand which moved from Riton, Wis., to destinations in Illinois served by the Chicago, North Shore & Milwaukee, on and after September 10, 1925. Examiner Smith said the Commission should find the rates were unreasonable to the extent they exceeded those in effect prior to August 10, 1925. The examiner said the increase that came into effect that day, brought about by the cancellation of the combination rule by the Chicago, Milwaukee & St. Paul, reflected no change in conditions. For that increase, he said, no sufficient justification was offered. Prior to August 10 the rate from Riton to Highland Park, Ill., which the examiner treated as typical, was 85 cents per ton. On that day it became $1.15 and a month later, $1.20.

On March 20, 1927, it became 80 cents. In each instance, except the last, there was a charge of $2.70 per car for switching to be added. No switching charge was shown in the report, as being in addition to the 80-cent rate.

17817. Examiner Burton Fuller, on further hearing, has recommended that the Commission affirm the findings in the original report, 118 I. C. C. 633, made by division 1, that the interstate rates on gravel and crushed stone, in carloads, from Joliet, Ill., to the Chicago, Ill.-Gary, Ind., district are unduly prejudicial to the complainants and unduly preferential of producers of slag at that point. In the original report the Commission prescribed rates of 65 and 85 cents per net ton, for single and joint line hauls, respectively, on each of the three commodities, as a method for the removal of the undue prejudice and undue preference. The rates were made effective February 15, 1927. A similar proceeding was had before the Illinois commission and similar findings and orders were made. This further hearing, like the original, was a hearing before the state and federal bodies.

Assuming, Fuller said, as intervener contended, it was necessary to make a lower rate on slag, as was done on June 25, 1918, when the Director-General made such a rate, to enable slag to compete with gravel and crushed stone, it was clear on this record, that to continue the lower rate on slag, at least beyond the effective date of the Commission's order, would be and would have been, unduly prejudicial to the complaining gravel and crushed stone producers at Joliet. The findings, in that respect, he said, should be affirmed. No order for the future, he said, was necessary.

Cement Rates in Oklahoma

IN a proposed report in No. 18208, Oklahoma Portland Cement Co. vs. Missouri Kansas-Texas et al., Examiner Harry C. Ames said the commission should find unreasonable the rates on cement, in carloads, from Ada, Okla., to some destinations in Texas, Louisiana and Arkansas and not unreasonable to others, and award reparation in instances where the rates were unreasonable. In disposing of the case he said:

The commission should find that the rates on cement, in carloads, from Ada, Okla., to the destinations indicated hereinafter over the short-line routes were unreasonable to the extent they exceeded the amounts set forth in connection with each destination or group of destinations: to Honey Grove, Tex., 17c; to Sulphur Springs, Tex., 18c; to Clarksville, Winnsboro, Pittsburg and Ennis, Tex., 19c; to Corsicana, Richland, Navarro, Wortham and Mexia, Tex., 19.5c; to Marshall, Tex., 20c; to Gilliam, La., 23.5c; and to Zwolle, De Ridder and De Quincy, La., and Beaumont, Tex., 25.5c. The commission should also find that the rates on cement, in carloads, in effect prior to November 10, 1924, and during the statutory period, from Ada to Alma, Mulberry, Altus, Clarksville, Morrilton, Palarm and Morgans Spur, Ark., were unreasonabe to the extent they exceeded 21.5c. The commission should also find that the present rates, on cement, in carloads, from Ada to the destinations in Arkansas named in the complaint, have not been unreasonable since November 10, 1924, and that the rates from Ada to all other destinations named in the complaint were not unreasonable.

In instances where the longer routes were employed, in transporting unrouted shipments, solely for the carriers' own convenience, reparation should be awarded on the basis of the rates found reasonable over the short lines, said the examiner.

Sand, Gravel and Crushed-Stone Producers of Southwest Hold Joint Session

Common Problem of Freight Rates Brings Two Industries Together for General Welfare

By Jean H. Knox
Consulting Engineer, Dallas, Texas

SAND, gravel and crushed-stone producers of the Southwest held a meeting at the Adolphus hotel in Dallas, Tex., on September 9 and 10 to discuss the coming hearing of the Interstate Commerce Commission on freight rates, set for October 31.

This meeting, representing producers from most of the Southwest states, was impressive and constructive, being the first time probably that so large a number of individuals and corporate interests of these two great industries have met in common relationship.

Producers Present

Those present included W. F. Wise, of the Stringtown Crushed Rock Co., McAllister, Okla., and the Texas Trap Rock Corp., San Antonio, Tex.; G. H. Cope, of Dolese Bros., Oklahoma, Okla.; E. Eikel, of the Dittlinger Lime Co., New Braunfels, Tex.; J. L. Lively, of the Jacksboro Stone Products Co., Jacksboro, Tex.; A. S. Goetz and E. A. Starr, of the Thurber Earthen Products Co., Ft. Worth, Tex.; C. Westbrook, of the Landa Rock Products Co., New Braunfels, Tex.; Max Altgelt, of the New Braunfels Limestone Co., New Braunfels, Tex.; E. C. Dodson, J. E. Lee and E. C. Vickers, of the Chico Stone Products Co., Dallas, Tex.; J. M. Chandler, of the Hughes Stone Co., Tulsa, Okla.; Frank Leffenwell, commerce attorney, Dallas, Tex.; I. W. Hall, of Hall Bros., Brownwood, Tex.; J. R. Boyd, secretary of the National Crushed Stone Association, Washington, D. C.; R. J. Hank, secretary of the Southwestern Division of the National Crushed Stone Association, Austin, Tex.; R. M. Quigley, of the Ft. Worth Sand and Gravel Co., Ft. Worth, Tex.; H. P Bonner, of the Ft. Worth Sand and Gravel Co., Ft. Worth, Tex.; F. E. Bolte, Dallas Washed and Screened Gravel Co., Dallas, Tex.; E. N. Adams, of Tulsa Traffic Association, Tulsa, Okla.; Fordyce Kimbell, representing traffic manager; Jahnche Service Bureau, New Orleans, La.; the North American Co., Shreveport, La., the Clements-Bisell Co. and the Brushy Gravel Co., Minden, La., and the Reader Gravel Co., Reader, Ark.; F. H. Gades, of the Consumers Gravel Co., Topeka, Kan.; L. W. Wells, Jr, of the Midland Sand and Gravel Co., Terrell, Tex.; P. W. Gifford, Noland Brown, of Gifford-Hill Co., Inc., Dallas, Tex.; W. H Gemmer, of Gemmer and Tanner, Houston, Tex.; Rhea Miller, of the J. Fred Smith Gravel Co., Dallas, Tex.; H. Y. Murff, of Murff Bros., Dallas, Tex.; Dan Harston, of the Trinity Gravel Co., Dallas, Tex.; Jean H. Knox, consulting engineer, Dallas, Tex.; T. J. Palm, of the Texas Sand and Gravel Co., Waco, Tex.; Robert J. Potts, of the Potts-Moore Gravel Co., Waco, Tex.; J. A. Coffey, of Missouri Portland Cement Co., St. Louis, Mo.; J. Mc. Stevenson and E. E. Luker, of the Hillsdale Gravel Co., Sweetwater, Tex.; Mr. Edmondson, of the West Point Co., West Point, Tex.; V. P. Ahearn, secretary of the National Sand and Gravel Association, Washington, D. C.; W. W. Carson, Jr., secretary of the Texas Sand and Gravel Producers Association, Austin, Tex.

Robert J. Potts, a director of the National Sand and Gravel Association and a member of the Texas Sand and Gravel Producers Association, presided as chairman of the joint meeting of the producers, calling upon all of the interested parties present, who discussed at length the various phases of the situation.

J. A. Coffey, whose company is an important producer of sand, gravel and crushed stone, said that while producers elsewhere are not at once affected by any change in freight rates in the states coming within the jurisdiction of the impending hearing by the Interstate Commerce Commission, any increase in the present rates would be of vital interest later and should be viewed with alarm everywhere; while a favorable decision of the commission which would stabilize rates or start a downward revision of rates would benefit industries in general.

Likely to Unload Burden on Other Commodities Than Those of Agriculture

Mr. Coffey called attention to the recent decision of the Interstate Commerce Commission, in a report written by Commissioner Aitchison, California Growers and Shippers Protective League vs. Southern Pacific, et al., the commission has prescribed rates on fresh diciduous fruits, other than apples, from California to transcontinental groups A to M, inclusive, which it denominates "the lowest possible lawful rates compatible with the maintenance of adequate transportation service and necessary to promote the freedom of movement of the specified products of agriculture now affected by depression." In other words, in conformity with the requirements of the Hoch-Smith resolution. The new rates are to be made effective not later than October 10, on not less than 15 days' notice.

In his concurrence Commissioner Woodlock said the Hoch-Smith resolution, which governed the disposition of this case, contained other injunctions addressed to the commission besides that which required the lowest possible lawful rates on products of agriculture suffering from depression. Twice, he said, it instructed the commission that in adjusting rates care should be taken to maintain an "adequate system of transportation." Continuing, he said: If these words mean anything they mean that, broadly speaking, we must shift some of the burden now borne by agricultural products suffering from depression, to other classes of traffic, meanwhile maintaining carrier revenues reasonably intact, failing evidence that these revenues are excessive. The new standard of measurement for rates on agricultural products implies new standards for rates on other commodities.

In his dissent, Commissioner McManamy said in part: "The majority report as well as the concurring expressions show that the decision is predicted upon the Hoch-Smith resolution. To my mind too much weight is given to the provision relating to the level of the rates and too little to other provisions of that resoluion. If the rates here established are to be made the basis of the future level of rates on these commodities throughout the country, I very much doubt if the desired standard of equipment and sevice can be maintained without placing a part of the burden on other traffic which I do not understand as contemplated by the Hoch-Smith resolution."

Mr. Coffey called attention to the fact that sand, gravel and crushed stone products carry the highest freight rates, based on values, of all basic commodities.

F. E. Bolte, who is a recognized authority in traffic matters, spoke of the shortness of time between now and the time set for the commission hearing and urged that proper legal and traffic counsel be engaged to assist in the preparation of evidence which will be placed before the commission.

Mr. Kimbell described tariff conditions in Louisiana, where sand, stone and gravel for public works move under special rates, and the part taken by the State Highway Commission which has counsel and funds available for proper presentation of their claims and interests in behalf of the state. While Mr. Kimbell was not authorized to guarantee at this time active co-operation with producers from other sections, he felt sure this would be the case, even though the Louisiana Highway Commission bears the expenses for cases revelant to Louisiana.

Mr. Wise, president of the Southwest Division of the National Crushed Stone Association and Mr. Quigley, president of the Texas Sand and Gravel Producers Association, addressed the meeting and assured the active co-operation and participation of their respective organizations to the fullest extent.

Action Taken

The hearing of the Interstate Commerce Commission to be held in Dallas, October 31, is to be a join investigation by the Interstate Commerce Commission and the State Commissions of the four Southwest states—Texas, Louisiana, Arkansas and Oklahoma. Following this there will be a hearing in New Orleans, and perhaps a third hearing at some other point to take additional evidence from the railroads.

The Railroad Commission of Texas has reopened its case wherein it recently prescribed a scale of rates.

The joint investigation is to be made to stabilize and establish a general uniform scale of rates applicable interstate and intrastate within and between the four Southwestern states.

Committees were appointed at the joint meeting of producers, one to raise the funds necessary for the proper presentation of the interests of the producers, and one to act as a general steering committee for the two groups and organizations of producers, sand and gravel and crushed stone producers, to employ counsel, and to provide for the proper compilation and presentation of testimony. E. Eikel, E. A. Starr and J. R. Boyd from the crushed stone producers and F. E. Bolte, Rhea Miller and V. P. Ahearn from the sand and gravel producers, were appointed to the steering committee.

Owing to the limited time between now and October 31, the scheduled time for the first hearing, a telegram was sent to the Interstate Commerce Commission at Washington requesting a postponement of the hearing until February, and Messrs. Boyd and Ahearn were instructed to confer on their return to Washington with Commissioner Lewis and Examiner Waters with reference to such postponement.

Copies of the telegram to the Interstate Commerce Commission were sent to each of the four state highway commissions with request that they give their active affirmation in seeking postponement of the proposed hearing.

Secretary V. P. Ahearn, of the National Sand and Gravel Association, and Secretary J. R. Boyd, of the National Crushed Stone Association, answered questions on the various phases of the situation in general, and assured the producers of the active co-operation of both national organizations of these two great industries.

Sand and Gravel Rate Reduction in Pittsburgh District Upheld

PETITION for a rehearing of a rate reduction ordered on sand and gravel carried by railroads in the Pittsburgh district was refused in a recent order of the public service commission.

The commission on August 8 sustained a complaint brought by 14 sand and gravel producers in the Pittsburgh district against 23 railroads which hauled the products. A schedule of reduction was ordered at the time. The decision is important to all the mineral aggregate industries because of the principles laid down.

The case was begun in 1920 on the complaint of producers in the Pittsburgh district that sand and gravel rates were too high *per se* as compared with rates in other territories. In 1922 the commission decided that central territory rates were not too high and refused to recognize any local situation. Then the present case was brought (in 1923) by the following companies as the Pennsylvania Sand and Gravel Association: Crawford Sand and Gravel Co., J. K. Davison & Bro., Iron City Sand Co., Keystone Sand and Supply Co., Lake Shore Sand and Gravel Co., Mercer Sand Co., Nickel Plate Sand and Gravel Co., Ohio River Sand Co., Pittsburgh Sand and Supply Co., and Universal Sand Co. Most of these producers are in the Pittsburgh territory and all are in western Pennsylvania. The rates are on shipments to destinations in New York, Ohio and West Virginia, and 20 railroads were included in the complaint.

The right of sand and gravel producers to have a low rate for their product, on account of its nature and the conditions under which it is transported, was upheld by the commission and the paragraph concerning this is so important that it is quoted in full as published in Rock Products, January 23, 1926:

"Sand and gravel are among the lowest grade commodities known to commerce, and cannot move except at low rates. They are transported exclusively in open top cars, loaded to and beyond the marked capacity of the car, the average being in excess of 50 tons, and move generally in as great a volume as slag or crushed stone. The average loading of 1238 cars from the Ambridge plant (Ohio River Sand Co.) in 1923 was 58.9 tons. Some plants load as high as 40 to 50 cars per day, and the entire day's output is generally moved from the plant at the time the empty cars are placed. An ample supply of empty cars is generally near at hand, and loading is usually accomplished in 24 hours. The risk and liability of loss and damage is negligible. The movement is generally in train lots and it is considered desirable traffic."

Concerning the rates on sand and gravel as compared with crushed stone and slag, the commission statement which was upheld says:

"Generally speaking, there is no transportation reason why the rates on sand and gravel should be higher than the rates on slag or crushed stone. In most territories and in the states they are given the same rates, and where we have prescribed scales in any territory or on all of them they have been rated the same. The rates complained of, considered as a whole, are clearly too high.

"We find that the defendants' rates on sand and gravel in carloads from complainants' shipping points in western Pennsylvania to destinations in Ohio, New York and West Virginia are, and for the future will be, unjust, unreasonable and unduly prejudicial, to the extent that they exceed the rates contemporaneously maintained on slag and crushed stone, in carloads, from and to the same points subject to the application of the following scales as a maximum for single line hauls, 20 cents per ton to be added for joint line hauls. In computing distances under this scale the shortest routes via existing connections for the interchange of carload traffic shall be used, embracing as a maximum the lines of not more than three line-haul carriers."

Distance (miles)	Rate (cents)	Distance (miles)	Rate (cents)
20 and under	60	125 and over 100	110
40 and over 20	70	150 and over 125	120
60 and over 40	80	175 and over 150	130
80 and over 60	90	200 and over 175	140
100 and over 80	100		

Southern Territory Lime Rate Revision Sustained

A REVISION on rates on lime in southern territory on which the shippers and carriers have been working since early in 1923 will go into effect as soon as the publishing agents can prepare their material. The Commission, by division 1, in a report written by Commissioner Lewis, in I. and S. No. 2874, fourth section application No. 600 and others, mimeographed, has found justified the rates proposed by the carriers in schedules which were to have become effective on various days between March 12 and March 29, 1927. The order of suspension has been vacated and the proceeding discontinued. Upon protests, the schedules were suspended until various dates. Respondents subsequently voluntarily postponed the operation of the schedules until October 17, 1927.

These revised rates will apply from producing points in Alabama, Georgia, Kentucky, Tennessee and Virginia to destinations throughout the southern territory. Rates will be stated in amounts per net ton, unless otherwise indicated. Numerous fourth section applications were also set for hearing. At and subsequent to the hearing, it was urged that the suspension be vacated and that the proposed rates be permitted to become effective by the Georgia Public Service Commission, Alabama Public Service Commission and producers in Georgia, Alabama, Virginia and Tennessee.

The revision was undertaken to remove fourth section departures, the moving consid-

eration in so many of the cases that have been considered by the Interstate Commerce Commission in the past eight years, and the establishment of rates on a uniform basis in the southern territory. The study of the rates, with a view to the change that has been made, was begun by the carriers in 1922 and early in 1923 they presented a mileage scale on a minimum of 30,000 lb. The scale was the same as that proposed by the Georgia commission for use in Georgia. Modifications were made and in the latter part of 1923, Mr. Lewis said, the modified scale was considered by shippers and carriers at a public hearing. At the request of shippers the carriers proposed an alernative scale based on a minimum of 60,000 lb., the rates being 80% of those based on the 30,000 lb. minimum. Later that minimum was reduced to 50,000, with the rates the same percentage of those on the 30,000 minimum.

Specific rates made in accordance with the scales and not the scales themselves are carried in the suspended tariffs. After the schedules were filed many protests were made. Likewise many shippers asked that the rates be allowed to become effective. After the hearings, all protests except three were withdrawn.

The scales of rates which are the bases for the rates under suspension are shown in the following table which shows in column A the rates in cents for a minimum of 30,000 lb. and in column B for a minimum of 50,000 lb.

	A		B	
Miles	Single	Joint	Single	Joint
5	70	80	56	64
10	90	100	72	80
15	100	110	80	88
20	110	120	88	96
25	120	130	96	104
30	130	140	104	112
35	140	150	112	120
40	150	160	120	128
45	160	170	128	136
50	170	180	136	144
55	180	190	144	152
60	190	200	152	160
65	200	210	160	168
70	210	220	168	176
80	220	220	176	176
90	230	230	184	184
100	240	240	192	192
120	250	250	200	200
140	260	260	208	208
160	270	270	216	216
180	280	280	224	224
200	290	290	232	232
220	300	300	240	240
240	310	310	248	248
260	320	320	256	256
280	330	330	264	264
320	340	340	272	272
360	350	350	280	280
400	360	360	288	288
440	370	370	296	296
480	380	380	304	304
520	390	390	312	312
560	400	400	320	320
600	410	410	328	328
640	420	420	336	336
680	430	430	344	344
720	440	740	352	352
760	450	450	360	360
800	460	460	368	368

All the state commissions either have approved or are expected to approve the rates. Virginia and North Carolina had peculiar conditions which precluded action in those states prior to the approval of the interstate rates.

The report indicated the basis upon which rates should be made from the Martinsburg, W. Va., group; from producing points in southern territory to Braithwaite, La., and to destinations in Louisiana territory west of the Mississippi, suggestions as to how they would handle those situations having been made by the carriers which seemed satisfactory to shippers interested. Commissioner Lewis said those dispositions should become effective contemporaneously or as nearly contemporaneously as possible with the rates found justified. The question whether the rates applied to crushed oyster shell lime was not passed upon. The carriers contended the rates did not apply.

Abandonment of Ohio Railroad Affects Sand and Slag Plants

THE Interstate Commerce Commission has issued a certificate authorizing the Ohio River and Western Railway to abandon, as to interstate and foreign commerce, a portion of its line between Woodsfield and Zanesville, Ohio. The company has asked authority to abandon its entire line from Bellaire to Zanesville, 110 miles, but the certificate is issued on condition that the company shall sell any part of its line between Woodsfield and Lawton to anyone desiring to purchase it for continued operation.

The railway officials allege that for a number of years the total revenues from railway operations have been inadequate to meet operating expenses and taxes, notwithstanding that most rigid economy had been observed in the management of the road, and that it is financially unable to repay advances made to it from time to time, or pay the interest on its outstanding bonds, or to repair and maintain the railway properties so that the same may be economically and efficiently operated. The volume of traffic has never been heavy, but in recent years the earnings of the company have been reduced materially by the use of automobiles, busses and motor trucks operating over improved highways. Agriculture and coal mining are the principal industries in the territory traversed by the railroad. There are two coal mines located on the eastern end of the line betwen Bellaire and Woodsfield, and three coal mines and several sand pits on the western end of the line between Zanesville and Lawton.

The proposed abandonment is opposed by the county commissioners of Monroe county and by the Ohio State Highway Department on the ground that the cost of hauling slag for road work for any considerable distance would be prohibitive, and the protest of the Standard Slag Co. is based upon the fear that contracts for slag to be used in present or prospective roads in the vicinity of the applicant's line will be cancelled if railroad service is withdrawn. It appears, however, that most of the contracts call for delivery at points in Belmont and Monroe counties, and in the event of continued operation of that portion of the line between Bellaire and Woodsfield by the applicant the protestants would be assured of reasonable service.

Right of Railroads to Lower Rates to Be Free from Prejudice

RAILROADS have an option in establishing rates lower than reasonable maximum rates and lower than the rates the Interstate Commerce Commission may prescribe, but they may not exercise that option "to the prejudice of any shipper or any locality."

That is the conclusion reached by Interstate Commerce Commission Examiner, C. W. Berry, made public on August 26 in a proposed report for findings in the case of the Potomac Electric Power Co. et al. v. the Chesapeake and Ohio railway et al., Docket No. 18641. The proceedings before the commission concerned rates on bituminous coal to the District of Columbia and adjacent territory on the lines of the Chesapeake and Ohio, the Norfolk and Western and the Virginian from West Virginia, Kentucky and Virginia producing points.

The examiner in making his recommendations to the commission that certain rates on coal shipments to Washington and adjacent Maryland and Virginia territory were prejudicial, said:

"It is the fundamental purpose of the act under which the commission operates to compel carriers as public agents to give equal terms to all, to cut up by its roots every form of discrimination, favoritism and inequality and to place all shippers on equal terms."

The report stated that even if rates now maintained by the Pennsylvania and Baltimore and Ohio in conjunction with the Chesapeake and Ohio from mines on the Chesapeake and Ohio were sub-normal rates that fact would not justify the refusal of the carriers parties to these rates, to establish rates on a parity therewith from comparable districts on the Norfolk and Western and Virginian.

Who Owns White River Gravel?

BARTHOLOMEW county, Indiana, may be made defendant in several suits as a result of removing gravel from White river at points where it touches privately owned land. The gravel is used in repairing of roads.

Counsel for Jesse Newsom, farm owner, raised the question, saying that suit would be filed unless Newsom was paid. County officials contend that White river is a navigable stream and therefore persons owning land touching it have title only to the water's edge. It is further asserted that deeds give only such title.

Discussion of the issue brought up several points, including a statement that even though the county's contention as to title is right, it should pay for privilege of hauling gravel removed across farms.—*Greensburg* (Ind.) *News.*

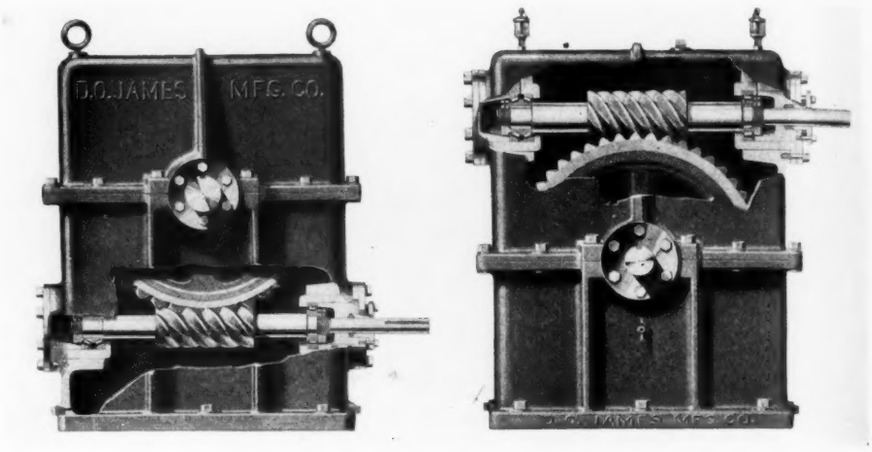
New Machinery and Equipment

New Worm Gear Speed Reducer

D. O. James Manufacturing Co., announce an advanced type of worm gear speed reducer for heavy duty uses. In the new machine, the gears are of phosphor bronze, the worms of chrome-nickel steel, the roller bearings of Timken and Norma Hoffman make and interchangeable bushings are used. The gear shafts are of ground carbon steel and made oversize to allow for strains in starting and overload, the manufacturers say. A lock nut and lock pin, which are said to allow for easy adjustment are used to hold the thrust bearing in position on the worm shaft. A large heat radiating and oil cooling space in the housing, it is claimed, keeps the oil at a low, even temperature, and prevents over-heating. The stuffing gland on the worm shaft prevents oil leakage. It can be replaced without disturbing the shaft.

When the worm is at the top of unit, sight feed oil cups are used for furnishing oil to the roller bearings on the worm shafts. The oil level cock, fitted into the side of the housing, is said to prevent over-oiling. An oil drain plug in the lower part of the housing facilitates cleaning and draining of gear oil.

The housings are of gray iron, designed to give a large oil cooling space and braced on the outside for strength.



New worm gear speed reducer

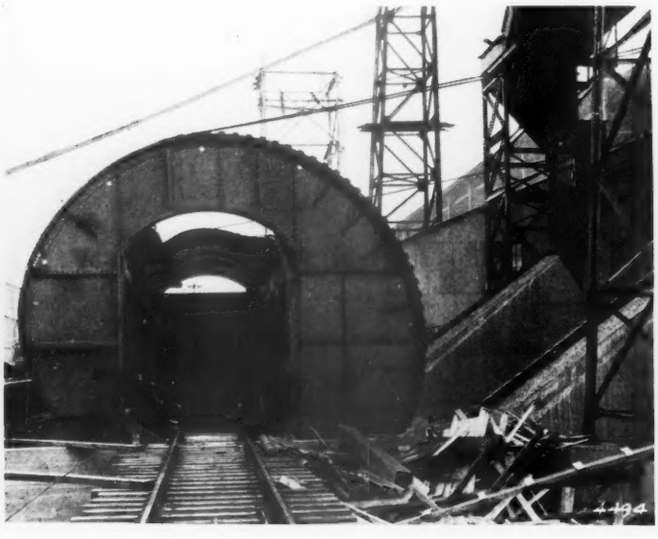
Unique Car Dumper Installation

AN unusual car dumping arrangement for handling limestone from railroad cars to storage has recently been installed at the Florida Portland Cement Co. plant near Tampa.

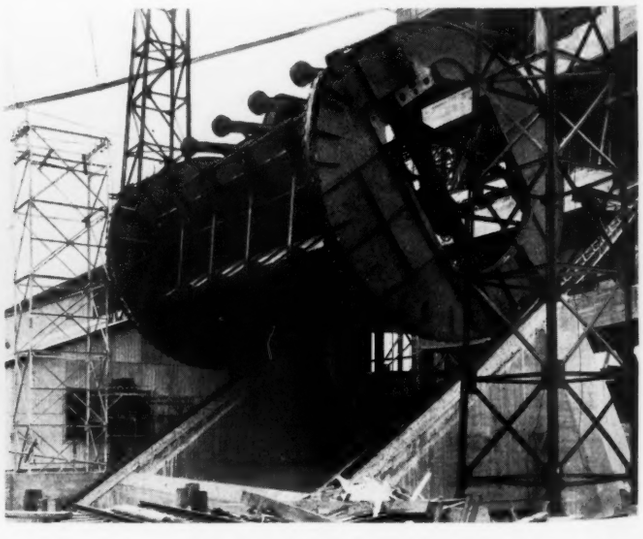
The peculiar conditions surrounding this installation required an equipment which would unload the cars without providing the usual storage bins under the dumper. The general level of the ground is only a few feet above water level, and it was desired to provide storage for a day's use at the crusher plant without rehandling, and by rolling the dumper up an incline a bin was not necessary and sufficient storage was provided to meet the requirements.

The dumper, as may be observed from the illustrations, is "rolled" into its dumping position upon steel girder runways which are inclined at approximately 35 deg. The machinery for "rolling" the dumper up the incline is mounted on foundations at the ground level under the crusher tower, and consists of two drums spaced 50 ft. center to center, each drum being driven by a double reduction of cut gearing, the second intermediate shaft extending the full distance between the drums, being geared at the center to the driving motor, and being provided with a manually operated brake used only in an emergency, the service brake being electrically operated and attached directly to the motor.

Four car clamps of a pivoted counterweight type are provided to hold the cars while in dumping and return position. Each clamp has an independent operating mechanism. As the dumper rotates in the dumping direction, the counterweight rollers move up the inclined guides, the clamp lifting ropes pay off the lifting drum and the slides and beams are lowered by their own weight until they rest on the top of the car, at which time the drum rotation stops. The counterweight arm hangs vertical until the pawl is



End view of car dumper showing car in place and the holding clamps in a descending position



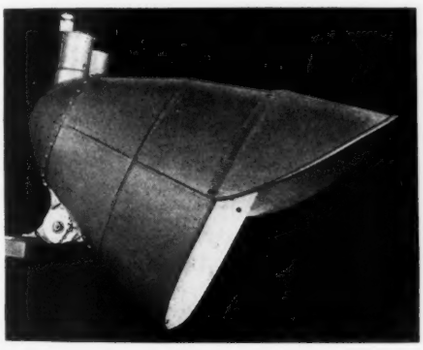
The dumper rolling up the incline. The car dumps at an elevation above the track

thrown into engagement, which occurs after the cradle has rotated about 45 deg. Reverse rotation of the dumper, after the contents have been discharged, reverses all the operations and returns the mechanism to the original starting positions.

The dumper is driven by a 115-hp. electric motor provided with a full torque magnetic brake and a controller of the magnetic switch type. The machine is fitted with a geared limit switch to slow down and stop the rolling of the dumper in either direction. The arrangement is claimed to handle open top railway cars from 7 ft. to 12 ft. 6 in. high, 9 ft. to 10 ft. 6 in. wide and overall lengths of 50 ft. inside of cars, and having a loaded weight of car and contents of 220,000 lb., i.e., cars with 80 tons capacity of rock, at the rate of 20 cars per hour. It was designed and constructed by the Wellman-Seaver-Morgan Co., Cleveland, Ohio.

Large Flood-Light Projectors for Night Operations

A NEW line of large flood-light projectors, adaptable for use in night operations about the quarry, pit or other places has been recently brought out by Cahill Bros., New York. Several different designs



Flood-light projector for night operations

among them being the "Giant Duplex" projector of 2000 w. are included.

The principal advantages claimed for these projectors are great beam spread, good diffusion throughout, low glare or dazzle and low operation cost. The large size projector, pictured herewith, carries two 1000-w. bulbs and is 29x39 in. in size, the light chambers being from 16 to 25 in. deep.

New 2¼ Yard Revolving Shovel

THE Marion Steam Shovel Co., Marion, Ohio, has recently developed and placed on the market the Type 490 full revolving electric shovel. This machine, rated 2¼ cu. yd., is equipped with Ward-Leonard control and is said to be especially adapted to heavy quarry service and sand and gravel operations.

The machine is mounted on two-belt rigid crawling traction trucks. The control for all motions is located at the operator's position, including steering, which is controlled by rotating the cab. The lower frame is a one-piece alloy steel casting, designed to withstand the severe service of hard digging and steady operation.

The main body of the upper frame is a heat-treated alloy steel casting, to which structural extensions have been added to complete the upper deck for mounting the main machinery. All parts entering into the construction of the upper frame have been reinforced.

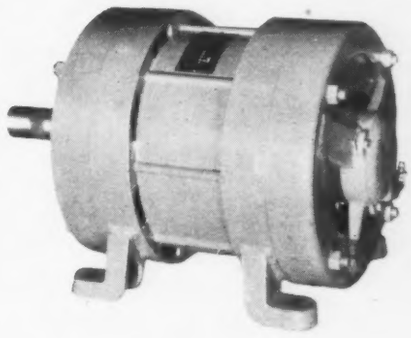
The front end equipment consists of an all-steel boom, a combination wood and steel dipper handle of the "inside" type, and a dipper of special design to meet the conditions encountered in rock work. A three-part hitch running in large drum and sheave diameters is used. The front end construction follows the construction used for many years on the railroad type of shovel.

The machine is equipped with a strong all-steel house suitably ventilated and arranged to protect the machinery from the elements and from blasting operations.

New All-Steel Ball-Bearing Induction Motor

A COMPLETE line of all-steel, ball-bearing polyphase induction motors, ranging in size from 1 to 100 hp. in all standard voltages and cycles, is announced by the Lincoln Electric Co. of Cleveland, Ohio. This type of motor is representative of the new designs of equipment being brought out by that company, in which gray iron and malleable castings have been entirely replaced by hot rolled steel.

One of the advantages claimed for the all-steel construction is increased strength in all parts, particularly in the motor feet —the drop forged steel feet being welded on the rolled steel end rings of the motor. The end brackets or bearing supports are also made up of welded steel construction giving a complete all-steel motor.



New all-steel ball bearing induction motor

Less thickness of metal because of the strength of steel is required in the frame. It is claimed that the increased ventilation so obtained results in a considerable increase in the overload capacity of the motor, so that a continuous overload of from 10 to 50% can be handled by the motors, depending upon the size and speed.

Equipment Manufacturers Merge

STOCKHOLDERS of the Brown Hoisting Machinery Co., Cleveland, Ohio, and the Industrial Works, Bay City, Mich., have each approved the plans for consolidation of both companies into one company to be known as the Industrial Brownhoist Corp with A. C. Brown as president.

Full revolving electric shovel mounted on crawler treads

News of All the Industry

Incorporations

Magnolia State Gravel Co., Myles, Miss., $10,000.

Pinkston Sand Co., Michigan City, Ind., filed papers evidencing final dissolution.

Bloomington and Ellettsville Stone Co., Bloomington, Ind., increased capital stock from $50,000 to $200,000.

Clarence Sand and Gravel Co., Clarence, N. Y., $500,000. Millard P. Ryley, 40 Jewett Parkway, Buffalo, N. Y.

Lick Creek Gravel Co., Indianapolis, Ind., $20,000. Homer Rodehaver, E. Howard Cadle and Ola M. Cadle.

Yosemite Portland Cement Corp., San Francisco, Calif. Increased capital stock from $3,500,000 to $4,000,000.

Midwest Concrete Pipe Co., North Manchester, Ind., $35,000. F. L. Brinkman, M. V. Schubert and A. Hampman.

Burlington Sand and Gravel Co., Burlington, Iowa, $50,000. Albert Hagerly, president, and Louis Miller, secretary.

National Lime, Cement and By-Products Corp., Pittsburgh, Penn., 10,000 shares, no par value. To deal in lime and cement.

Monroe Sand and Gravel Corp., Rochester, N. Y., $50,000 preferred and 1,000 shares common. J. V. Jones, Rochester.

B. G. Hoadley Quarries, Inc., Bloomington, Ind., $200,000. Bird G. Hoadley, Katharyn K. Hoadley and John A. Hoadley.

South Seaville Sand and Gravel Co., Bridgeton, N. J., $100,000 preferred and 5,000 shares, no par value. Frank S. McKee, Bridgeton.

Adamant Super Cement Co., Los Angeles, Calif., $25,000. Graham M. Gordon, James Peake, C. W. Bongard, E. C. Pohlman and P. T. Kerckhoff.

Rogers County Stone and Cement Co., Okmulgee, Okla., $50,000. E. R. Jones, C. W. Randolph and L. A. Hunter, all of Muskogee, Okla.

Smoot Sand and Gravel Corp., Wilmington, Del., 300 shares, no par value. A. L. Miller, Alfred Jervis and E. B. Megear, all of Wilmington.

E. S. Bowden, Inc., Jacksonville, Fla., $10,000. To deal in cement products, stone and building material. E. S. Bowden, N. Bowles and Mary E. Bowden.

La Companie de Calcaire de Chambord, Ltd., Chambord, Quebec, $20,000. To operate limestone and sandstone quarries in the Lake St. John region of the Province of Quebec.

Toronto Lime Co., Ltd., Toronto, Canada. Increased capital stock by changing 705 shares at $100 par value each to 140 shares with the addition of 590 shares of no par value.

Virginia Dare Cement Building Block and Tile Corp., Norfolk, Va. Capital stock, $1,000 to $50,000. To manufacture and deal in building blocks of all kinds. D. W. Hayman, president; Laura Hayman, secretary, and D. W. Burgess.

Penniman Gravel and Material Corp., Dallas, Tex. Increasing capital stock from $15,000 to $30,000. The company deals in sand and gravel and also manufactures concrete building tile. Harry Penniman is president.

Standard Cement Construction Co., a Kentucky corporation, has filed articles of incorporation at Indianapolis to permit them to do business in Indiana. The company will manufacture, sell and install cement products, lime and artificial stone. Offices have been established at 3510 N. Pennsylvania St., Indianapolis.

Alabama-Quenelda Graphite Co., Birmingham, Ala., completing organization under laws of Delaware, with capital of $5,000,000; W. L. Shumate, Jr., president; T. R. Jones, vice-president, Comer Bldg., Birmingham; plans operating graphite plants in Clay county, Ala., near Ashland and Lineville; company owns about 2000 acres graphite-bearing lands, four graphite plants, modern refinery and finishing plant.

Quarries

Cleveland Stone Co., Cleveland, Ohio. Fire of an unknown origin destroyed the pump house at No. 6 quarry, resulting in damage of approximately $1,000.

Weston & Brooker Co., Cayce, S. C., producers of crushed stone, have installed a 2-yd. electric shovel in their quarry and have also added a large crane.

John T. Dyer Quarry Co., Morristown, Penn., operating three trap rock quarries, reports the largest aggregate shipments ever made from its three crusher plants at Birdsboro, Monocacy and Robeson Station, Penn., during the month of August. The total shipments were 228,000 tons of trap rock.

Banner Rock Products Co., Alexandria, Ind., is planning the erection of additional buildings at its plant in Alexandria. The company has received permission to extend a switch track across three streets in order to reach new property which it has acquired in the west side of the city. Kenneth Huffine is superintendent of the plant and Alton Jones has recently been made his assistant.

Colorado Decorative Marble Co., Villa Grove, Colo., is about to resume operations after a shutdown of eight months due to the death of the former manager. W. D. Sedgewick of Dallas, Tex., now has charge of the quarry and he plans to install new machinery at once. The quarry ships marble dust to the East and South, where it is used in the construction of floors and interior walls and in decorative work.

Sand and Gravel

Bedford Nugent Co., Evansville, Ind., has leased a gravel bed on the Ohio river near Maceo, Ky., from Daviess county.

Bowling Green, Ky. The county board of Wood county, Ky., has purchased equipment for removing river gravel for use in road work.

Clear Lake, Iowa. C. F. Crane and Ray Sandry have purchased the sand and gravel plant east of Clear Lake and have already begun operations.

Janesville Sand and Gravel Co., Janesville, Wis., is planning to build a one-story fireproof office building with a basement for automobile storage at its plant in Janesville.

Imlay City, Mich. Lapeer county road commission has purchased the Anderson gravel pit and is installing machinery to remove the gravel for use on the county roads.

John Westover, Lincoln, Neb., has purchased 20 acres of gravel land near Hanover, Kan., and is planning to expend about $20,000 for gravel machinery and open a large pit on the property.

Bevan & Stingley, Wilmington, Ohio, have sold the pit machinery and gravel washing equipment at their gravel pit near Wilmington to Charles H. Collins and Ray Humphreys, who will continue the operation of the plant.

Springfield Washed Gravel Co., Springfield, Ohio. George B. Smith was appointed receiver for the company and was directed to continue operations pending the decision of the court. It is claimed that the company has sufficient assets, if equipment is included, to meet all its liabilities.

California Materials, Inc., Whittier, Calif., a new corporation capitalized at $2,000,000, has bought the property and business of the Sycamore Canyon Gravel Co. of Whittier. The change was made to furnish larger capital, and also to provide a firm name which would indicate the diversified service of the company, which operates stone crushers as well as gravel plants. J. D. Gregg, manager of the old company, continues as manager for the new concern.

Silica Sand

Northwest Mineral Products Co., Tacoma, Wash., has leased silica sand deposits at Merritt, Wash., and will start shipping the silica from the property as soon as its new plant is completed in Tacoma.

Cement

Mathieson Alkali Works, Inc., New York, N. Y., plan the construction of a cement plant at Saltville, Va., with a yearly capacity of 1,000,000 bbl.

Indiana Portland Cement Co., Greencastle, Ind., recently was host to many of the contractors of Indiana at an all-day meeting as a part of its educational program.

Colonel H. C. Boyden, of the Celite Products Co., recently delivered a paper on "The Use of Diatomaceous Earth in Concrete" to the Colorado section of the A. S. C. E.

Missouri Portland Cement Co., St. Louis, Mo., have completed the grading and much of the excavation for their new quick-hardening cement plant. Some of machinery for the new plant has already arrived.

North American Cement Corp., Albany, N. Y. A fire at the Berkely, W. Va., lime plant, caused evidently by the wetting of a car of lime, resulted in damage estimated at $60,000. The main portion of the plant was not damaged.

Monolith Midwest Portland Cement Co., Los Angeles, Calif., has let the contract for its new $2,000,000 plant near Laramie, Wyo., to the MacDonald Engineering Co., Chicago.

Yosemite Portland Cement Co., Fresno, Calif., has moved its general offices from Fresno to Merced, Calif., where the company's mill is now located, in order to bring about greater efficiency. At the same time branch sales offices were opened in Oakland, Sacramento, Stockton and Bakersfield, Calif. D. A. Schlemmer, general sales manager, will move from Fresno to San Francisco.

A rock slide adjacent to the Yosemite company's quarry at Emory, Calif., buried the tramway under 50,000 tons of rock. The slide occurred before the men had come to work and no one was injured, nor was any equipment damaged. However, it was necessary to work the cement mill at Merced for two weeks on part time since the supply of stone was cut off. It is supposed that the slide was due to blasting in the quarry.

Cement Products

Sinclair & Shane Co., Weslaco, Tex., are establishing plants at Weslaco and Harlingen, Tex., for the manufacture of concrete face brick.

Wheeling Patent Block Co., Wheeling, W. Va., is building a $25,000 plant to manufacture Straub patent cinder block, with an annual capacity of 1,000,000 block. The equipment will be manufactured by the Consolidated Concrete Machine Corp. W. P. Gwathmey is owner and manager of the company.

Newberry Concrete Works, Newberry, S. C., plans the construction of a new plant for the manufacture of concrete pipe and building block. The company is affiliated with the Oriental Concrete Works, Oriental, N. C., and equipment from the plant at Oriental will be used in the new plant. Graydon Lewis and Charles Lewis are the owners of the company.

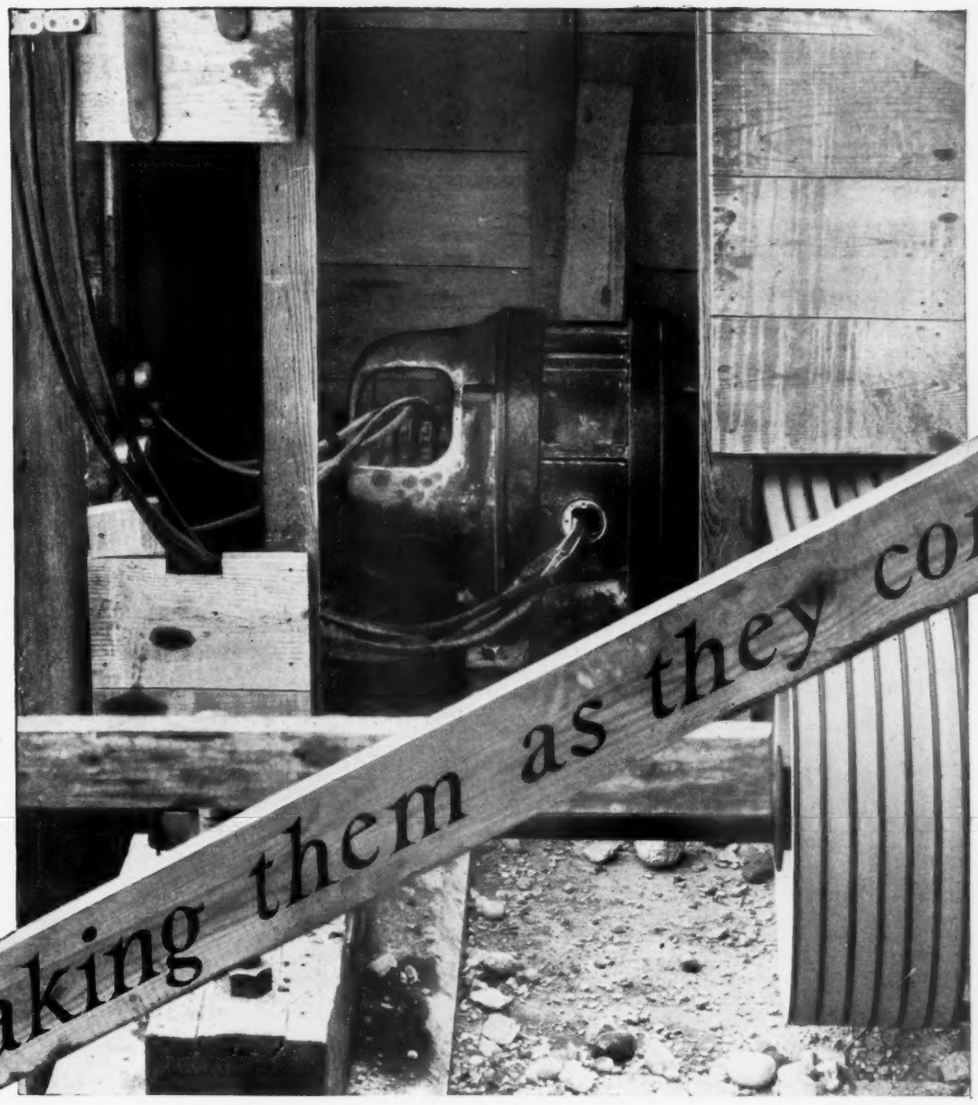
Miscellaneous Rock Products

Miller Mining Co., Carterville, Ga., producer of ochre, is reported to be planning the extension of its operations, including the construction of a new railroad.

Canton, Ohio. Petition for involuntary bankruptcy was filed against the Canton Material Co. recently by three creditors, a cement company, a lime company and a gypsum company. The claims of the creditors amount to $2,006.

Virginia-Carolina Chemical Co., Richmond, Va., manufacturer of industrial chemicals, including the production of rock phosphate, is said to be planning extensions and improvements in its plant at Shreveport, La., to cost approximately $75,000 with equipment.

Cuban Rock Asphalt Co., New Orleans, La., plans the construction of asphalt handling plants in several gulf ports, including New Orleans. The report of the incorporation of the company, which



The rough wiring and set-up suggest that this motor is not favored by the best conditions. Allis-Chalmers Texrope Drive, an industrial sensation, particularly for short-center work, is here being used to belt a 50 h. p. Allis-Chalmers type ARY roller bearing motor to an Allis-Chalmers Gyratory Crusher.

The grinding rush of rock through a gyratory crusher forms one of the fiercest tests of electric motor performance. The shock loads on this job reveal the extra strength of Allis-Chalmers steel frames and positively locked cores. That Allis-Chalmers anti-friction motors are thoroughly practical for such rough, heavy work is evidence of greater bearing capacity also.

Allis-Chalmers motors equipped with Timken Bearings are protected not only against the wear and friction of radial loads, but also against thrust and shock. Timken tapered design compactly provides so much more capacity for every bearing stress that smaller housings and shorter shafts are actually possible.

Timken Bearings permit perfect enclosure, keeping all grit out, and retaining all the lubricant, which never needs attention more than a couple of times yearly! That is all it takes to maintain the correct gap permanently, even on the toughest, most exposed jobs. These bearings protect the windings from soaking, and the special Allis-Chalmers insulation process means permanent protection against weather and dust.

More than likely there are some profit possibilities for you in all these Allis-Chalmers superiorities. Consult the nearest office.

ALLIS-CHALMERS MANUFACTURING CO., MILWAUKEE

District Sales Offices in All Principal Cities

ALLIS-CHALMERS MOTORS

owns rock asphalt quarries in Cuba, was in the September 17 issue of ROCK PRODUCTS.

Standard Fertilizer Co., Williamston, N. C., affiliated with the Standard Wholesale Phosphate Co., Baltimore, will proceed with the erection of a new local plant, 100x200 ft., to cost in excess of $75,000 with equipment. The company was organized recently by George A. Whiting and C. B. Mitchell, Sr., Baltimore, Md.

Personals

Fred W. Connell, secretary of the Indiana Crushed Stone Association, has been made president of the board of public safety of Indianapolis, Ind.

Luther H. Bosnian has been made the superintendent of the Park Street, Milwaukee, plant of the Chain Belt Co., Milwaukee, Wis. Mr. Bosnian has been with the company for eight years.

Glen D. Cooper has been appointed assistant sales manager for the Speeder Machinery Corp., Cedar Rapids, Iowa. Mr. Cooper, who is an electrical engineer, will have charge of the organization and development of the industrial field.

Obituaries

Harry L. Scott, sales representative for the Lehigh Portland Cement Co., died at his home in Indianapolis, Ind., following a sudden attack of pneumonia. Mr. Scott was 38 years old and had been with the Lehigh company for 20 years.

Fred MacCarthy, production manager for the Cleveland Stone Co., Cleveland, Ohio, died on September 11. Operation of all of the Cleveland company's quarries ceased for an hour on September 14, at the time of the funeral, in respect to Mr. MacCarthy.

Manufacturers

Alexander Millburn Co., Baltimore, Md., has opened a sales and distribution office at Wiggin Terminals Bldg., Boston, Mass. M. B. Crouse and G. B. Malone will be in charge.

Bates Valve Bag Co., Chicago, Ill., has recently brought out a broadside on its "multi-wall" paper bags for cement and plaster. The pamphlet features the experiences of one dealer with these bags during the recent Mississippi river flood.

Chicago Pneumatic Tool Co., New York City, announces the appointment of J. C. Fitzpatrick as district manager of sales at 1241 E. 49th St., Cleveland, Ohio, succeeding J. L. Westenhaver, who has resigned to enter into business for himself.

Marion Steam Shovel Co., Marion, Ohio, has moved its southern offices from Atlanta, Ga., to Birmingham, Ala. Carl W. Fries is district manager and E. M. Hanley, assistant district manager. The territory to be served through the Birmingham office includes Alabama, North and South Carolina, Georgia, Florida, Tennessee, Mississippi, Louisiana and the eastern part of Arkansas.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., announces the promotion of R. L. Wilson, works manager of the East Pittsburgh works, to assistant to vice-president and general manager, and J. M. Hipple, manager of the motor engineering department, to works manager. Mr. Wilson has been with Westinghouse company for 34 years, having stated as a draftsman in 1893. Mr. Hipple began with the company in 1898.

Thew Shovel Co., Lorain, Ohio, has added five new men to its sales organization. J. S. Griffin is to cover New Mexico, Colorado and Wyoming, with headquarters at Denver; E. L. Sparks will be in charge of California sales; J. L. Tront is to handle the Pennsylvania, Ohio and West Virginia territory; P. S. McMillen is now sales engineer, attached to the Chicago office, and M. B. Garber has been appointed promotion engineer.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Bearings. Bulletin on Rollway radial bearings for roll neck service and crane neck bearings. Capacities, design and other data. ROLLWAY BEARINGS CO., INC., Syracuse, N. Y.

Osgood Shovels. Pictorial broadside showing Osgood shovels working at different projects, plants, etc. THE OSGOOD CO., Marion, Ohio.

Recording Instruments. Booklet on steam flow meters, CO_2 meters, pyrometers and draft gages. BROWN INSTRUMENT CO., Philadelphia, Penn.

G. E. Bulletins. GEA-788 on type FT squirrel cage motors; **GEA-813** on magnetic reversing switches; **GEA-821** on pressure and vacuum switches.

C-E Fin Furnace. Bulletin FF-2 illustrating and describing the C-E Fin furnace. Setting drawings, plant layouts and construction data. COMBUSTION ENGINEERING CORP., New York.

Plug Valves. Illustrated bulletins on Merco Nordstrom valves for the gas industry, gasoline extraction plants, petroleum industry, chemical industry and cement plants. Construction and cost data, design, etc. MERCO NORDSTROM VALVE CO., San Francisco, Calif.

Wolf Equipment. Bulletin on Wolf continuous vacuum filters for handling lime sludges, chalk sludges, etc., and possible use in filtering cement slurry. Details of design, construction data, illustrations of installations; catalogs on steam locomobiles of the types NEH, single cylinder superheated steam machine for power and heat; class NTK, tandem compound condensing superheated steam locomobile, and type LFV11, a compound portable machine for work about quarry, plant, etc. MORRILL & MORRILL, New York.

Building for First Half of Year Showed Decline of 6.3%

BUILDING operations declined slightly more than 6% in value during the first half of 1927, according to an estimate just announced by the Department of Labor. This estimate was based upon returns received from 78 cities of a population of 100,000 or more, and compiled by the Bureau of Labor Statistics. The decline was estimated to be in excess of 7% in the number of families provided for.

The announcement, in full text, follows:

In the first half of 1926 permits covered an expenditure for new buildings in these 78 cities of $1,474,785,929; in the first half of 1927 the amount for new buildings was $1,381,910,891, which was 6.3% less than in 1926. These figures include all kinds of new buildings, dwellings, stores and factories.

These 78 cities provided dwellings in new buildings for 201,685 families in the first six months of 1926 and for only 187,133 families in the first six months of this year. In the first half of 1926 the number of families provided for in one-family dwellings was 36.7% of all families provided for in new residences. In the corresponding period of 1927 this percentage had fallen to 34.6%. In contrast, the percentage of families provided for in apartment houses rose from 49.9% in 1926 to 51.7% in 1927.

The 80 cities reporting for the first half of 1927 had a population of 32,280,223 and a per capita expenditure for buildings of all kinds of $47.22. Of this amount $42.94 was the per capita expenditure for new buildings and $4.28 the expenditure for repairs.

Yonkers, N. Y., showed the greatest per capita expenditure of any city reporting, $131.19 per inhabitant being spent on building operations in that city during the first six months of this year. Fort Worth, Tex., with a per capita expenditure of $89.40, and Flint, Mich., with $83.45, followed in order.

In these 80 cities families were provided with homes in new dwellings at the rate of 58.2 families to each 10,000 of population. The following cities were the five leading home builders in the first half of 1927. The ratio shown is the number of families provided with homes to each 10,000 of population based on the population as estimated by the Bureau of the Census for July 1, 1927—Yonkers, 172.4; San Diego, 132.8; Flint, 121.3; Fort Worth, 110.7, and New York, 99.2.

Building permit data were obtained from eight cities for which no estimate of population as of July 1, 1927, is available. These cities are included in the total, however, and in the computations they have been credited the population as of the last available estimate. These older estimates are not deemed sufficiently accurate to use for each individual city, but they are believed satisfactory for use in the total. No estimate was made for some cities because they were falling off in population, nor for others because they were growing faster than a normal rate. State census 1925 figures are used for two cities.

[The foregoing data evidently refer only to building construction and not to engineering construction; production statistics of portland cement, sand, gravel and crushed stone show that the volume of construction this year exceeds any year on record.—Editor.]

OWNERSHIP OF ROCK PRODUCTS

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of ROCK PRODUCTS, published every second Saturday at 542 South Dearborn street, Chicago, Ill., for October, 1927, State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared Nathan C. Rockwood, who, having been duly sworn according to law, deposes and says that he is the manager of ROCK PRODUCTS, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Tradepress Publishing Corp.; Editor, Edmund Shaw; Managing Editor, Nathan C. Rockwood; Business Manager, Nathan C. Rockwood.

2. That the owners of 1 per cent or more of the total amount of stock are: W. D. Callender, Nathan C. Rockwood, both of 542 South Dearborn street, Chicago, Ill.

3. That there are no bondholders, mortgagees, or other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

NATHAN C. ROCKWOOD,
Business Manager.

Sworn to and subscribed before me this 20th day of September, 1927.
(SEAL) CHARLES O. NELSON.
(My commission expires April 13, 1930.)